GODIVA Prima Pump with Integrated SmartCAFS

Models: PC1_ or PC2_ with FoamLogix 2.1A, 3.3, 5.0, 6.5 Systems and SmartCAFS50, 100, 200 Control

Maintenance Manual



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AMENDMENT RECORD

Model: PC1_ or PC2_ with FoamLogix 2.1A, 3.3, 5.0 or 6.5 Systems

and SmartCAFS50, 100 or 200 Control

Mod	Date	Page/s	Amendment	New Issue No.
1	September 2010	All	New Issue	Issue 1,
2	October 2010	P27	Item 1 – run compressor for 15 minutes to remove water.	Issue 2
3	August 2011	101	Add New Foam Flow Sensor Replacement Instructions for FoamLogix 2.1A	Issue 3
3	August 2011	12, 17	Gauges – do not clean with solvents	Issue 3
4	April 2012	18	Gearbox oil capacity – now 1.2 litres	Issue 4
5	September 2014	All	Add information on CAFS100, CAFS200 where relevant	Issue 5
6	April 2022	102-193	Updated spare parts Manual	Issue 6
7	October 2022	102-193	Updated spare parts Manual	Issue 7
8	January 2023	102-193	Updated spare parts Manual	Issue 8
9	January 2023	211-279	Updated P1-P2 workshop Manual	Issue 8
10	May 2023	102-193	Updated spare parts Manual	Issue 9

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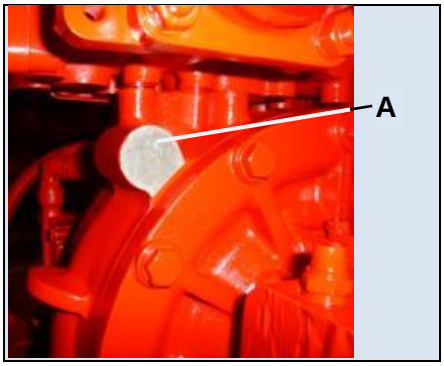
1. INTRODUCTION

This document contains preventive and corrective maintenance procedures for Godiva single or multi-pressure Prima Pumps equipped with Compressed Air Foam Systems (CAFS), FoamLogix Models 2.1A, 3.3, 5.0 or 6.5 and the SmartCAFS50, 100 or 200 control system. Differences between these models are clearly identified in the relevant procedures.

The information in this manual should be used in conjunction with the Godiva Ltd manuals and other manufacturers' documentation that is provided in Section 11, Appendix.

PUMP SERIAL NUMBER

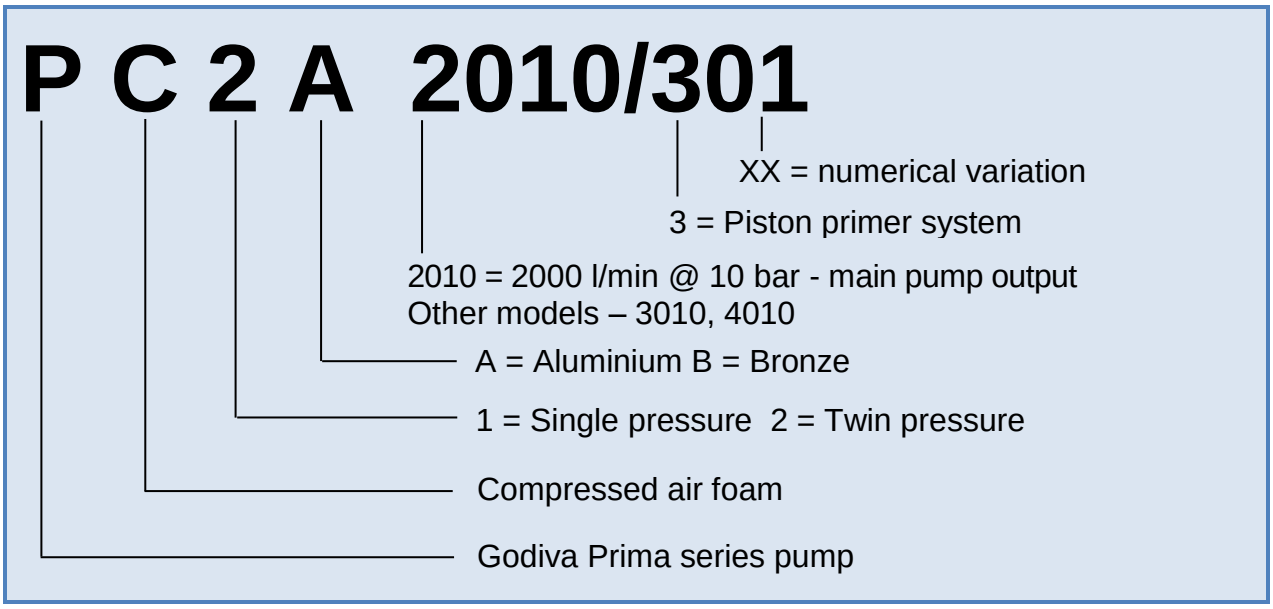
When contacting Godiva Ltd, always quote the six figure serial number that is stamped on a machined boss (A) on top left of the pump volute body, e.g. 602517.



MODEL IDENTIFICATION

Variations of the Godiva Prima pump with CAFS are identified as follows:

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IMPORTANT NOTES

The terms 'Left Hand' (LH) and 'Right Hand' (RH) apply when the pump unit is viewed from the suction tube end. This is regarded as the **front** of the assembly.

The user must make sure that the equipment is maintained in a safe operational condition. Local legislative conditions may apply. In the UK, Maintenance (Regulation 5) of the Provision and Use of Work Equipment Regulations 1998 applies.

When working on the equipment, comply with the precautions and guidelines given in Section 3, and in the ancillary equipment documentation in Section 11, Appendix.

This Godiva equipment must be maintained only by trained personnel. Please contact Godiva Ltd. to discuss your training needs.

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2. DESCRIPTION

The PC1_ or PC2_ is a Compressed Air Foam System comprising three main components (in addition to the water pump) – Air Compressor, FoamLogix (foam proportioning unit) and Manifold (foam mixing and control system).

The FoamLogix components (foam pump and motor assembly) are mounted separately from the water pump and are designed to be remotely mounted according to the vehicle builder's requirements.

A metered amount of foam concentrate is introduced into the CAFS Manifold and mixed with water from the pump discharge manifold to produce a solution. The foam and water solution is then fed to an air ratio control valve (ARC) where wet or dry foam may be selected (air ratio control section of manifold). Compressed air is then injected and the resulting foam / water / air combination is completely mixed by the X-mixers during discharge

Safety interlocks are provided to safeguard the operator.

1. Air injection is prevented if:-
   - Foam flow is not detected
   - FoamLogix is not turned on
   - Foam supply is depleted
   - Water flow is not detected
2. Compressor over temperature protection gives a warning at 105^{o}C and disengages the compressor at 110^{o}C.
3. The air ratio control valve defaults to WET on loss of air pressure.
4. The compressor clutch is protected by a pressure switch from being engaged at too high a speed (above 2400rpm) or if there is too much pressure in the compressor.

COMPRESSOR

Three different compressors are used for the three levels of Prima SmartCAFS-

Prima model	**Compressor**	**Compressor output**
Prima SmartCAFS50	Tempest 3	50scfm @ 7 bar
Prima SmartCAFS100	Tempest 6	100scfm @ 7 bar
Prima SmartCAFS200	Edura 12	200scfm @ 7 bar

All three compressors are rotary twin-screw types and driven by a Polydrive belt from the main pump PTO. The compressor is engaged, or disengaged from the pump drive, via an electro-magnetic clutch, which is activated by the CAFS selector switch.

Compressor lubricating oil is cooled by water taken from the main pump, via the water supply line; cooling water being supplied from pump delivery and returned to pump suction.

Compressor	**Heat energy rejected to cooling (approximate)**
Tempest 3	8.0 kW
Tempest 6	22 kW
Edura 12	32 kW

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When the compressor is stationary, residual system pressure is vented by a blow-down valve.

NOTE: The compressor must not be run without cooling water.

CAFS MANIFOLD (all models)

The manifold incorporates an air ratio control valve through which varying degrees of water/foam can be selected. Compressed air is then injected and the resulting foam / water / air combination is fed to discharge.

A by-pass valve will obtain the required dry foam flow rate. This valve is adjusted and set during the installation stage..

CAFS units are best suited for use with fresh water.

For salt water compatible foams, seek advice from the foam agent manufacturers.

FOAMLOGIX - FOAM PROPORTIONING SYSTEM

The FoamLogix system consists of three main components:

1. Foam Pump / Motor Assembly.
2. Control Panel (integral with main pump control panel).
3. Water flow meter and injection manifold.

All three elements combine to provide accurate foam proportioning. From the control panel the operator can initiate the system, adjust the foam ratio, monitor 'real time' water flow rate and record total water and foam concentrate usage.

The FoamLogix system is powered up when the PTO is engaged. Foam concentrate is only injected when the red ON control button is operated or Wet or Dry button selected.

The Foam ON light will illuminate when the FoamLogix is turned on, and flash when injecting foam.

Model	Foam injection range %	Foam output	Foam type
FoamLogix 2.1A	0.1 – 1.0	8 l/min	Class A only
FoamLogix 3.3	0.1 – 10.0	12.5 l/min	Class A and B
FoamLogix 5.0	0.1 – 10.0	19 l/min	Class A and B
FoamLogix 6.5	0.1 – 10.0	25 l/min	Class A and B

Detailed information is provided in the FoamLogix Installation and Operation Manuals in Section 11, Appendix.

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3. SAFETY PRECAUTIONS

INTRODUCTION

The equipment manufactured by Godiva Ltd has been designed with safety in mind. Where hazards cannot be eliminated, the risk has been minimised by the use of guards and other design features. Some hazards cannot be guarded against so the instructions on the equipment are responsible for safe working practices at all times.

BEFORE WORKING ON THE EQUIPMENT, THIS SECTION MUST BE CAREFULLY READ, UNDERSTOOD AND STRICTLY ADHERED TO.

- Make sure that the pump operating area is kept clean and free from obstructions that may restrict access to the controls and maintenance points.
- Make sure that access to the equipment is restricted to the personnel responsible for maintenance and they are trained, adequately qualified and provided with appropriate tools.
- Make sure that personnel responsible for maintenance have access to and study the appropriate instructions before any work is done.
- Suitable personal protective equipment must be available and utilised where necessary.
- Do not smoke while operating or working on the equipment.
- Do not wear loose or frayed clothing or jewellery that could catch on or become trapped in the equipment.
- Make sure that the equipment operates within its specified limits.
- The safety instructions in this section identify potential hazard types that may occur on the type of vehicle pump installation covered in this manual.
- Refer also to safety related information for ancillary equipment given in the appropriate manufacturer's documentation.

INCORRECT MAINTENANCE OF THE GODIVA LTD PUMP EQUIPMENT COULD RESULT IN PERSONAL INJURY.

SAFETY SYMBOLS

Within this document, safety instructions are marked with safety symbols.



Practices that could affect personal safety if the warning is ignored

ATTENTION Practices that could affect safe operation of the pump and personal safety

IMPORTANT Practices that could result in damage to the equipment

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EQUIPMENT HAZARDS AND SAFETY INSTRUCTIONS

The safety instructions listed below have been categorised in relation to each hazard type that may occur. Some hazards listed may not occur on the specific equipment supplied, but are included to cover potential hazards that may be encountered with equipment of this type.

Fluids, Gases and Fumes

Vehicle exhaust gases are hazardous if inhaled. Do not operate the pump where there is insufficient ventilation to quickly clear the fumes. Do not operate the equipment close to flammable fluids, substances or structures.

Batteries

Battery gases are hazardous and flammable. Do not expose to sources of heat and naked flames. Keep the area well ventilated to clear gases quickly.

Hot Surfaces

Some equipment surfaces will remain hot after the pump has stopped. Allow sufficient time for cooling before maintenance. Be cautious and note that other parts of the equipment may become hot if a fault is developing.

Equipment Handling

Do not lift heavy weights without assistance. Only use lifting equipment with a safe working load suitable for the weight of the component(s) being lifted. Lift any component part by its lifting point(s) or use suitable slings.

Entrapment

Do not touch any moving or rotating parts. Where guards have been removed for maintenance, they must be replaced before operating the equipment.

Electrical

Always disconnect the equipment from the electrical supply before working on the equipment and take steps to prevent inadvertent reconnection. When working on electrical circuits always use insulated tools to minimise possibility of electric shock and/or cause a short circuit.

Fluid Pressure

Make sure that the equipment operates at below its specified Maximum Working Pressure. Before working on the equipment, make sure that all internal pressure is relieved. Safety glasses or goggles must be worn when working on pressurised systems.

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Noise

Ear defenders must be worn when the equipment is running if the noise level exceeds the defined safe level. Make sure that any audible alarm or warning signal can still be heard when wearing ear defenders.

Fibrous Materials

A mask or respirator must be worn when working with components that contain fibrous material as these can be hazardous if fibrous dust is inhaled. Safety glasses or goggles may also be necessary, dependant on the work being performed.

Access

Clear and easy access to all controls, gauges, dials etc must be maintained at all times. The pump operating area must be kept clean and free from obstruction. Access to the equipment is restricted to the personnel responsible for operations or maintenance.

Hazardous Materials

Be aware of hazards relating to fluids and materials used in maintenance operations, especially the danger from inhalation of noxious and toxic fumes, skin and eye contact or penetration. Always use suitable personal protective equipment. Refer to the COSHH data sheets relating to these materials and note the recommended emergency and first aid procedures. Hazardous or flammable materials must not be stored near to the equipment.

Cold Conditions

Do not operate the pump equipment in temperatures below freezing point without first checking that the pumped fluid is not frozen and the pump is free to turn. Pumps in these environments must be drained down during periods of inactivity.

Gauges

Do not clean the glass surfaces of the gauges with abrasive or solvent cleaners. These will cloud the glass surface. Use a mild detergent and water.

ENVIRONMENTAL PROTECTION

It is prohibited to pour oil and other contaminants onto the ground, down sewers, drains, or into water courses.

Dispose of lubricants through authorised waste disposal contractors, licensed waste disposal sites, or to the waste reclamation trade.

If in doubt, contact your Local Environmental Agency for advice regarding disposal policies.

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4. GENERAL DATA

COMPRESSOR	
Used with Prima SmartCAFS50 (50scfm rating) -	
Model	Tempest 3
Maximum Operating Speed	10000 rev/min
Nominal speed of operation	6250 rev/min
Nominal power consumption	12.0kW
Direction of rotation	Anti-clockwise (viewed on pulley)
Volume output	1420 l/min
Operational pressure range	4 – 10 bar
Cooling system	Oil/water shell and lube type
Cooling water flow rate	10/15 l/min @ 10bar
Used with Prima SmartCAFS100 (100scfm rating) -	
Model	Tempest 6
Maximum Operating Speed	8000 rev/min
Nominal speed of operation	5350 rev/min
Nominal power consumption	28.0kW
Direction of rotation	Anti-clockwise (viewed on pulley)
Volume output	2830 l/min
Operational pressure range	4 – 10 bar
Cooling system	Oil/water shell and lube type
Cooling water flow rate	20/30 l/min @ 7bar
Used with Prima SmartCAFS200 (200scfm rating) -	
Model	Enduro 12
Maximum Operating Speed	650 rev/min
Nominal speed of operation	5000 rev/min
Nominal power consumption	40.0kW
Direction of rotation	Anti-clockwise (viewed on pulley)
Volume output	5650 l/min
Operational pressure range	4 – 10 bar
Cooling system	Oil/water shell and lube type
Cooling water flow rate	50 l/min @ 7bar

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FOAM PROPORTIONING SYSTEM 2.1A - CLASS A FOAM COMPATIBLE	
Manufacturer	Hale Products Inc.
Model	FoamLogix 2.1A
Type	Electronic foam proportioning system
Operating voltage	12 or 24 volt systems as specified
Fuse rating 12V / 24V	50 / 40 amp
Current draw (Operating) 12V / 24V	25 / 13 amp
Current draw (Max) 12V / 24V	40 / 20 amp
Wire size 12V / 24V	Minimum 6.0mm^2
Max. Foam Agent Flow rate	8.0 l/min
FOAM PROPORTIONING SYSTEM 3.3 – CLASS A AND B FOAM COMPATIBLE	
Manufacturer	Hale Products Inc
Model	FoamLogix 3.3
Type	Electronic foam proportioning system
Operating voltage	12 and 24 volt systems available
Fuse rating 12V / 24V	60 / 40 amp
Current draw (Operating) 12V / 24V	30 / 15 amp
Current draw (Max) 12V / 24V	60 / 30 amp
Wire size 12V / 24V	Minimum 8.5mm^2
Max. Foam Agent Flow rate	12 l/min
FOAM PROPORTIONING SYSTEM 5.0 – CLASS A AND B FOAM COMPATIBLE	
Manufacturer	Hale Products Inc
Model	FoamLogix 5.0
Type	Electronic foam proportioning system
Operating voltage	12 and 24 volt systems available
Fuse rating 12V / 24V	60 / 40 amp
Current draw (Operating) 12V / 24V	30 / 15 amp
Current draw (Max) 12V / 24V	60 / 30 amp
Wire size 12V / 24V	Minimum 8.5mm^2
Max. Foam Agent Flow rate	19 l/min

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FOAM PROPORTIONING SYSTEM 6.5 – CLASS A AND B FOAM COMPATIBLE	
Manufacturer	Hale Products Inc
Model	FoamLogix 6.5
Type	Electronic foam proportioning system
Operating voltage	12 and 24 volt systems available
Fuse rating 12V / 24V	60 / 40 amp
Current draw (Operating) 12V / 24V	30 / 15 amp
Current draw (Max) 12V / 24V	60 / 30 amp
Wire size 12V / 24V	Minimum 8.5mm^2
Max. Foam Agent Flow rate	25 l/min
DIRECTION OF ROTATION - GEARBOX INPUT FLANGE	
Clockwise only - viewed on gearbox input drive flange	

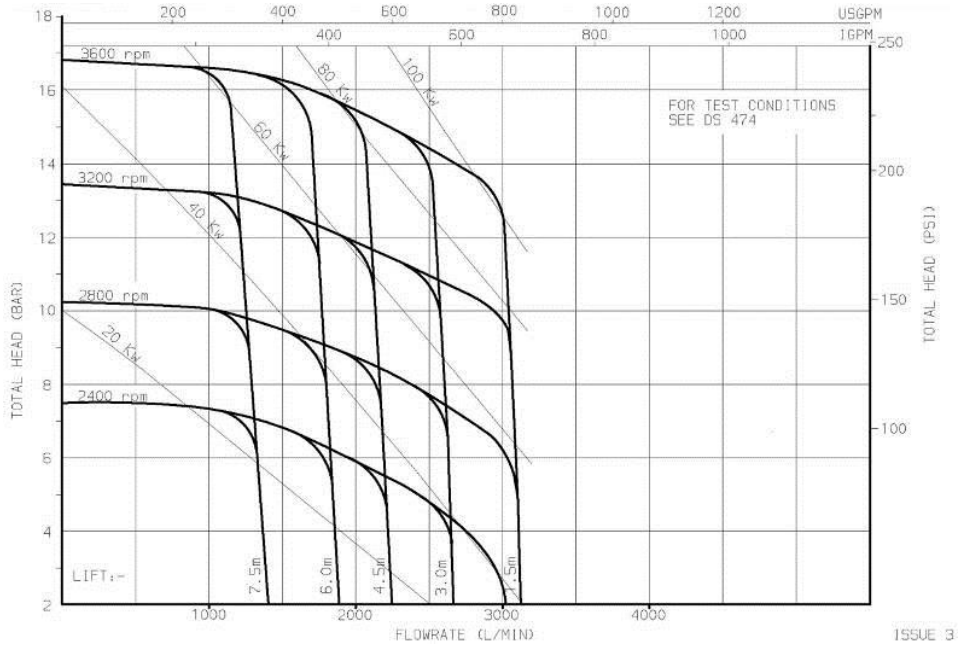
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PERFORMANCE DATA PC1_

Performance Data	2010	3010	4010	6010
Priming Performance Range	To 7.5m	To 7.5m	To 7.5m	To 7.5m
Priming Speed (recommended)	2500 rev/min	2500 rev/min	2500 rev/min	2500 rev/min
Maximum Suction Pressure	12 bar	12 bar	12 bar	12 bar
Maximum Recommended Speed	3600 rev/min	3600 rev/min	3600 rev/min	3600 rev/min
Minimum Idle Speed	900 rev/min	900 rev/min	900 rev/min	900 rev/min
For other applications, please contact Godiva Ltd.				
Maximum Outlet Pressure – Low Pressure (EN compliance)	17 bar	17 bar	17 bar	17 bar
Maximum Flow – Low Pressure	3400 l/min	4200 l/min	6200 l/min	7750 l/min
Weight (based on aluminium model). Approx. weights will vary according to specification and gunmetal specification	347 kg	347 kg	TBA kg	TBA kg
Typical Dimensions (L x W x H) mm	888 x 900 x 925	888 x 900 x 925	TBA	TBA
EN1028 Priming Times from 7.5 m	22 sec	32 sec	32 sec	TBA
Thermal Relief Valve Activation (optional feature)	42ºC or 74ºC	42ºC or 74ºC	42ºC or 74ºC	42ºC or 74ºC

Basis of Data: 2010 with Piston Primer, 2 UK Delivery Valves, 4" RT suction. 3010/4010/6010 with Piston Primer, 4 UK Delivery Valves, 5 ½" RT Suction. Mounted on standard platform.

P1_2010 Performance Curve



EN1028:1 Rated Performance

P1_2010	P1_3010	P1_4010	P1_6010
2000 l/min	3000 l/min	4000 l/min	6000 l/min
At 10 bar	At 10 bar	At 10 bar	At 10 bar
3m lift	3m lift	3m lift	3m lift

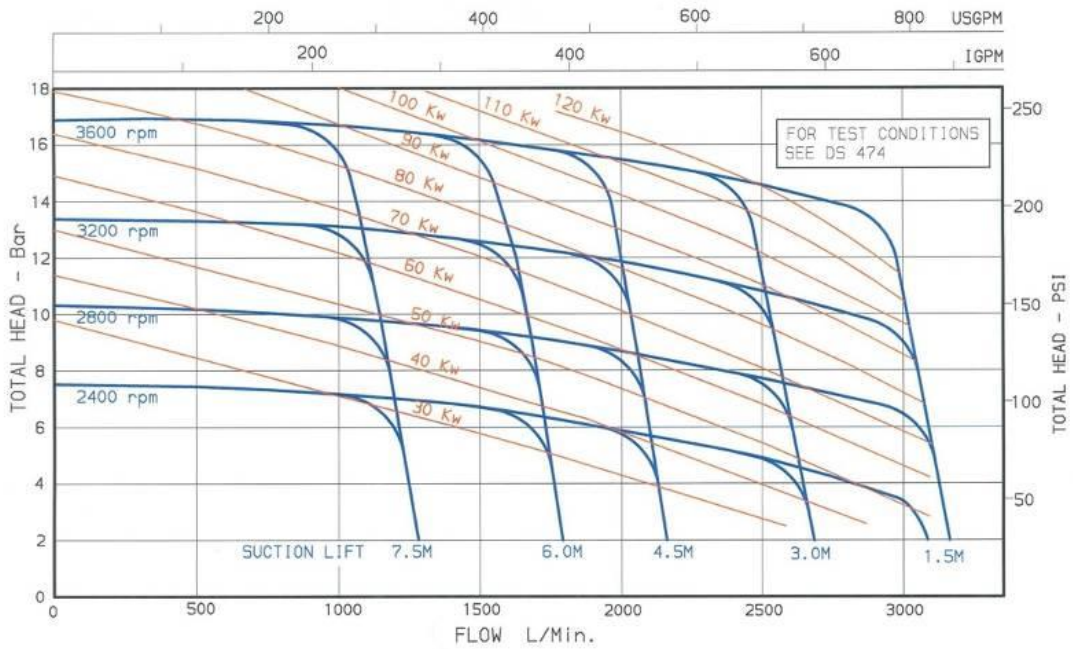
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PERFORMANCE DATA PC2_

Performance Data	2010	3010	4010	6010
Priming Performance Range	To 7.5m	To 7.5m	To 7.5m	To 7.5m
Priming Speed (recommended)	2500 rev/min	2500 rev/min	2500 rev/min	2500 rev/min
Maximum Suction Pressure	12 bar	12 bar	12 bar	12 bar
Maximum Recommended Speed	3600 rev/min	3600 rev/min	3600 rev/min	3600 rev/min
Minimum Idle Speed	900 rev/min	900 rev/min	900 rev/min	900 rev/min
For other applications, please contact Godiva Ltd.				
Maximum Outlet Pressure – Low Pressure (EN compliance)	17 bar	17 bar	17 bar	17 bar
Maximum Outlet Pressure – High Pressure (EN compliance)	54.5 bar	54.5 bar	54.5 bar	54.5 bar
Maximum Flow – Low Pressure	3400 l/min	4200 l/min	6200 l/min	7750 l/min
Maximum Flow – High Pressure	770 l/min	770 l/min	770 l/min	770 l/min
Weight (based on aluminium model). Approx. weights will vary according to specification and gunmetal specification	361 kg	361 kg	TBA kg	TBA kg
Typical Dimensions (L x W x H) mm	922 x 900 x 925	922 x 900 x 925	TBA	TBA
EN1028 Priming Times from 7.5 m	22 sec	32 sec	32 sec	TBA
Thermal Relief Valve Activation	42ºC or 74ºC	42ºC or 74ºC	42ºC or 74ºC	42ºC or 74ºC

Basis of Data: 2010 with Piston Primer, 2 UK Delivery Valves, 4" RT suction. 3010/4010/6010 with Piston Primer, 4 UK Delivery Valves, 5 ½" RT Suction. Mounted on standard platform.

P2_2010 Performance Curve



EN1028:1 Rated Performance

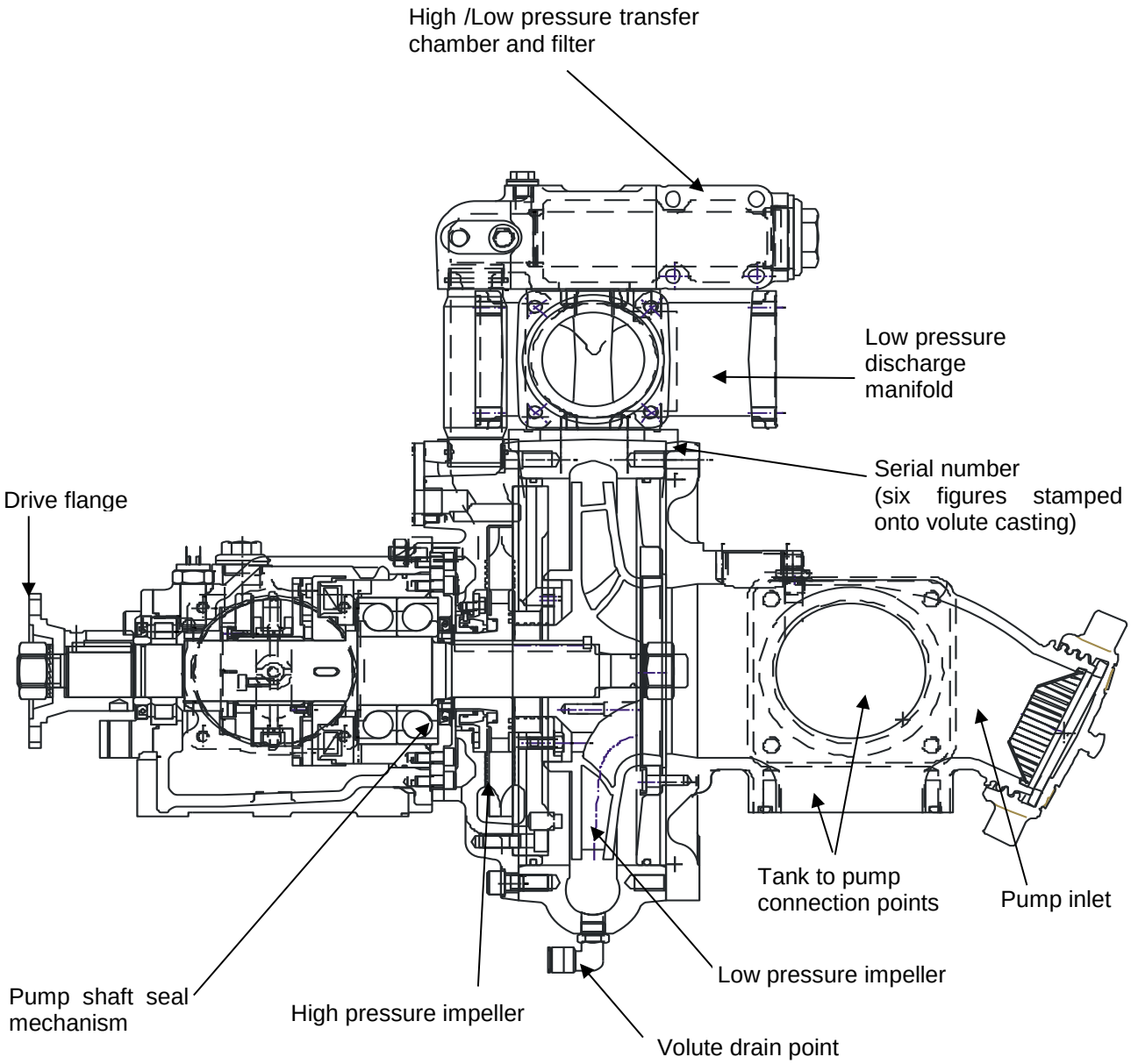
P2_2010	P2_3010	P2_4010	P2_6010
2000 L/min	3000 l/min	4000 l/min	6000 l/min
At 10 bar	At 10 bar	At 10 bar	At 10 bar
3m lift	3m lift	3m lift	3m lift
High pressure rating 250 L/min at 40 bar			

FIRE SUPPRESSION GROUP

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CROSS SECTION OF TYPICAL PRIMA PUMP

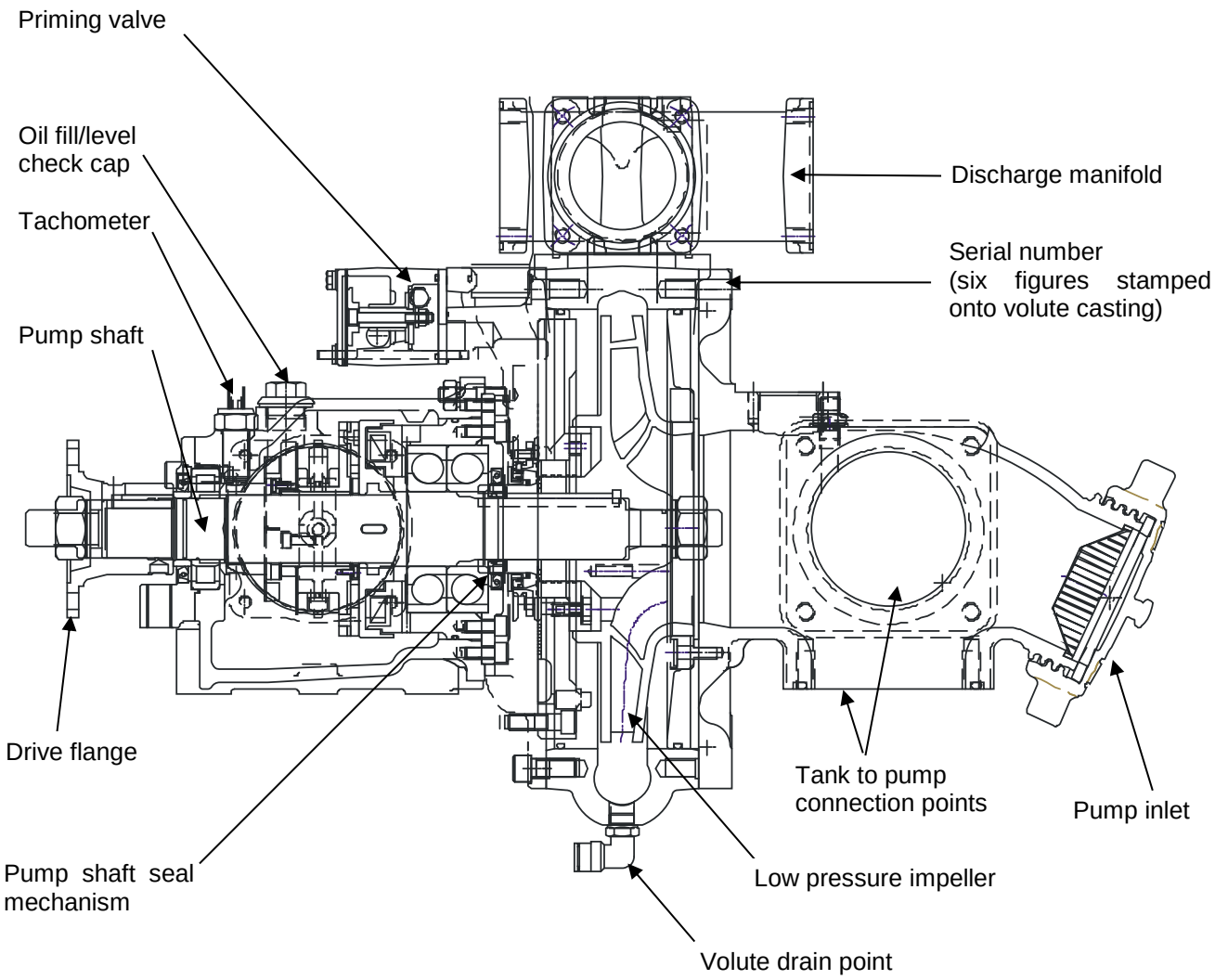
P2 pump shown



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CROSS SECTION OF TYPICAL PRIMA PUMP

P1 pump shown



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5. MAINTENANCE

INTRODUCTION



WARNING! BEFORE WORKING ON THE EQUIPMENT, THE SECTION ON SAFETY MUST BE CAREFULLY READ, UNDERSTOOD AND STRICTLY ADHERED TO.

Godiva Ltd equipment will provide many years of trouble-free service when maintained in accordance with the preventive maintenance schedule and operations specified in this manual.

The instructions in this manual cover the major elements of preventive and corrective maintenance but do not include basic checks by the user or procedures for specialised operations that must be carried out by a Godiva Ltd service technician.

For some maintenance operations on ancillary equipment, details are not included in this manual. In this case, clear directions are given to the appropriate procedure in the ancillary equipment manufacturer's documentation that is provided with this manual.

Good preventive maintenance routines are essential to ensure that the equipment is serviceable and always available when required to operate in an emergency. Therefore, a high degree of cleanliness of the equipment and the surrounding vehicle area must be maintained at all times.

Maintain full access to the pump bearing housing, compressor and gearbox oil fill points and level checkpoints as well as access for general maintenance operations.

The vehicle pump area must be adequately shielded from the ingress of road spray / debris and chassis and vehicle power train lubricant. Exposure to dirt, water and grease will have a detrimental effect on the working life of the drive belt and electronics.

Do not clean the glass surfaces of the gauges with abrasive or solvent cleaners. These will cloud the glass surface. Use a mild detergent and water.

When contacting Godiva Ltd, always quote the six figure serial number that is stamped on a machined boss on the pump volute body.



WARNING! FAILURE TO COMPLY WITH THE MAINTENANCE PROCEDURES IN THIS MANUAL MAY RESULT IN SERIOUS PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT

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OPERATING FLUIDS

To ensure optimum performance and equipment life, use only the lubricant and foam concentrates specified in this manual.

Never mix different grades/makes of oil or foam concentrates. They are manufactured for a specific duty, and mixing different grades/makes may result in adverse chemical reactions that result in loss of quality.

Make sure that all operating fluids are kept clean and free from contamination, chemicals, dust and metal particles.

APPROVED LUBRICANTS

COMPRESSOR	
Lubricant	Screw compressor oil in compliance with ISO Viscosity grade 32 to 46
Alternative	SAE 10W/40 automotive multigrade oil
Capacity	Tempest 3 - 3.5 litres - (approximately 4.0 litres with filter change)
	Tempest 6 - 4.5 litres - (approximately 6.0 litres with filter change)
	Enduro 12 - 12 litres
GEARBOX	
Lubricant	BP Energol GR XP 68 or similar
Capacity	1.2 litres approximately
PUMP – Bearing housing	
Lubricant	10W/40 or 15W/40 Multi-grade engine oil.
Capacity	1.0 litre approximately

FOAM CONCENTRATES

FoamLogix Models 2.1A, 3.3, 5.0 or 6.5 can be used with the foam concentrates specified on the Foam Concentrate Compatibility List provided at the rear of this manual. These foam concentrates have been tested by Hale Products to ensure compatibility with the FoamLogix system.

Note that FoamLogix Model 2.1A is suitable only for Class A foam usage.

This information is intended to assist the end user in selecting compatible foam concentrate(s) but is not a determination of fire fighting efficiency.

Many fire fighting foam chemical manufacturers have specific instructions on handling and use of their products including, but not limited to, shelf life, tank life, and intervals between uses. Always follow manufacturer's instructions for use.

Always consult local application and environmental regulations before selecting a foam concentrate and refer to the FoamLogix Installation and Operation Manuals for additional information.

IDEX FIRE SUPPRESSION GROUP

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SERVICE KIT

For Maintenance up to 24 Months

QUANTITY	SPARE PART	PART NUMBER	COMMENT
Compressor – Tempest 3			
1	Separator element	59271/02	
4	Oil Filter	59271/01	
2	Air Filter	59271	
1	Drive Belt	60578/01	
1	Drive Belt Tensioner	60579	
Compressor – Tempest 6			
1	Separator element	TAM-03498328	
4	Oil Filter	TAM-89675429	
2	Air Filter	TAM-81166609	
1	Drive Belt	60578/03	
AR	Drive Belt Tensioner	65447	
Compressor – Enduro 12			
4	Oil Filter	70025	
2	Air Filter	010-0690-00-0	
1	Drive Belt	61291	
AR	Tensioner assembly - Belt drive	61198/002	
PC2_ / PC1_			
A/R	High Pressure Strainer	60051	PC2_ only
4	Bonded Seal - Oil Drain	UFP 2303/08	
2	Bonded Seal - High Pressure Strainer	UFP 2303/15	PC2_only
2	Bonded Seal - NRV Inlet	UFP 2303/10	Common part
2	Inlet Valve - Primer	65009	End Cover
2	Outlet Valve - Primer	65008/002	End Cover
2	‘O’ Ring - Primer	65134	Piston/Cylinder
4	‘O’ Ring - Primer	61097	Piston/Cylinder
2	Water Seal - Primer	65119	Piston/Cylinder
2	Seal - Primer	65159	Piston/Cylinder
2	‘O’ Ring – Primer	65160	Piston/Cylinder
2	‘O’ Ring – Primer	52816	Piston/Cylinder
2	Seal - Primer	65161	Piston/Cylinder
2	‘O’ Ring – Primer	65162	Piston/Cylinder
2	Bonded Seal – Primer	MS133/8	Piston/Cylinder
2	Screw	65169	Piston/Cylinder
1	Diaphragm – Primer	56123	Priming Valve
1	Seal – Primer	55669	Priming Valve
1	‘O’ Ring – Primer	53750	Priming Valve

Under normal operating conditions the high pressure strainer is not deemed to be disposable (A/R). However, the strainer may be damaged during cleaning, so take care when handling. The customer must decide if this part is required.

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SPECIAL TOOLS FOR PRIMER SERVICING

QUANTITY	TOOL DESCRIPTION	PART NUMBER
1 1 1	Piston Seal Assembly Tool comprising: - Cone Locator Seal Expander	65239/65240 65239 65240
1	Cylinder Support Tool	65466
1	Circlip Fitting Tool	65436
1	Circlip Drift Tool	65467

EQUIPMENT MAINTENANCE LOG

Pump Serial Number . . . . . .

Use this log to record faults, part replacements and major overhauls.

Contact Customer Services at Godiva Ltd. before any proposed return of either a single part, or a complete assembly.

DATE	HOURS RUN	INSPECTION / FAULT	PARTS RENEWED	REASON FOR RENEWAL	INITIAL

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6. PREVENTIVE MAINTENANCE

INTRODUCTION



WARNING! BEFORE WORKING ON THE EQUIPMENT, THE SECTION ON SAFETY MUST BE CAREFULLY READ, UNDERSTOOD AND STRICTLY ADHERED TO.



WARNING! FAILURE TO COMPLY WITH THE PREVENTIVE MAINTENANCE SCHEDULE AND RELATED PROCEDURES IN THIS MANUAL MAY RESULT IN SERIOUS PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT.

Good preventive maintenance in accordance with the Preventive Maintenance Schedule and Procedures in this section is vital to ensure that the equipment is serviceable and always available when required to operate in an emergency.

It is essential that this Godiva equipment is maintained only by trained personnel.

When contacting Godiva Ltd, always quote the six figure serial number that is stamped on a machined boss on the pump volute body.

The terms ‘Left Hand’ (LH) and ‘Right Hand’ (RH) apply when the pump unit is viewed from the suction tube end. For the purposes of this document, this is regarded as the **front** of the assembly.

For some preventive maintenance operations on ancillary equipment, actual procedures are not included. In this case, clear directions are given to the ancillary equipment manufacturer’s documentation in Section 11, Appendix.

If using this manual on a computer, procedures may be accessed direct from the Preventive Maintenance Schedule by moving the cursor over the procedure number and doing a left click on the number. Similarly, you can return directly back to the Preventive Maintenance Schedule from the procedure by clicking in the ‘Back to Schedule’ field.

For additional maintenance guidance, refer to the Schematic and Circuit Drawings in Section 10, Diagrams.

Maintenance that is not covered by this manual must be done by trained, qualified service personnel authorised by Godiva Ltd or its representative.

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PREVENTIVE MAINTENANCE SCHEDULE

WARNING! BEFORE WORKING ON THE EQUIPMENT, THE SECTION ON SAFETY MUST BE READ, UNDERSTOOD AND ADHERED TO.

WARNING! FAILURE TO COMPLY WITH THE PREVENTIVE MAINTENANCE SCHEDULE AND PROCEDURES IN THIS MANUAL MAY INVALIDATE THE WARRANTY AND RESULT IN PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT.

Note: The Godiva Compressor service intervals replace those in the Gardner Denver Compressor manuals

EQUIPMENT	ACTION	PROCEDURE
EVERY 3 MONTHS		
PC1_/PC2_	Check the pump and gearbox oil levels	PM-001
	Do a vacuum test to test for leaks	PM-002
PC2_	Clean the high pressure filter	PM-003
Compressor – all models	Check the oil level and top up if necessary. Run compressor for 15 minutes	PM-004
	Check the drive belt tension and condition.	PM-005
FoamLogix – all models	Check that foam pipe connections are tight	PM-006
	Operate the system in bypass to move the concentrate and prevent gelling (if concentrate is left in the system **without use** for three months)	PM-007
EVERY 12 MONTHS		
PC1_/ PC2_	Change the bearing housing oil	PM-008
Compressor – all models	Change the air filter	PM-009
	Change the oil filter	PM-010
Gearbox	Change the gearbox oil	PM-011
FoamLogix – all models	Inspect wiring/connections, hoses/connections	PM-012
	Clean the foam strainer	PM-013
	Verify water flow calibration	PM-014
	Verify foam feedback calibration	PM-015
EVERY 24 MONTHS		
PC1_ /PC2_	Replace the primer seals	PM-016
	Replace the priming valve seals and diaphragm	PM-017
	Test the thermal relief valve	PM-018
Compressor – Tempest 3,6 models	Replace the oil separator element	PM-019
EVERY 5 YEARS		
Compressor	Replace the compressor drive belt	PM-020

IMPORTANT! In high usage or abnormal operating conditions, the above procedures may need to be more frequent.

IDEX FIRE SUPPRESSION GROUP

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PREVENTIVE MAINTENANCE PROCEDURE
PM-001

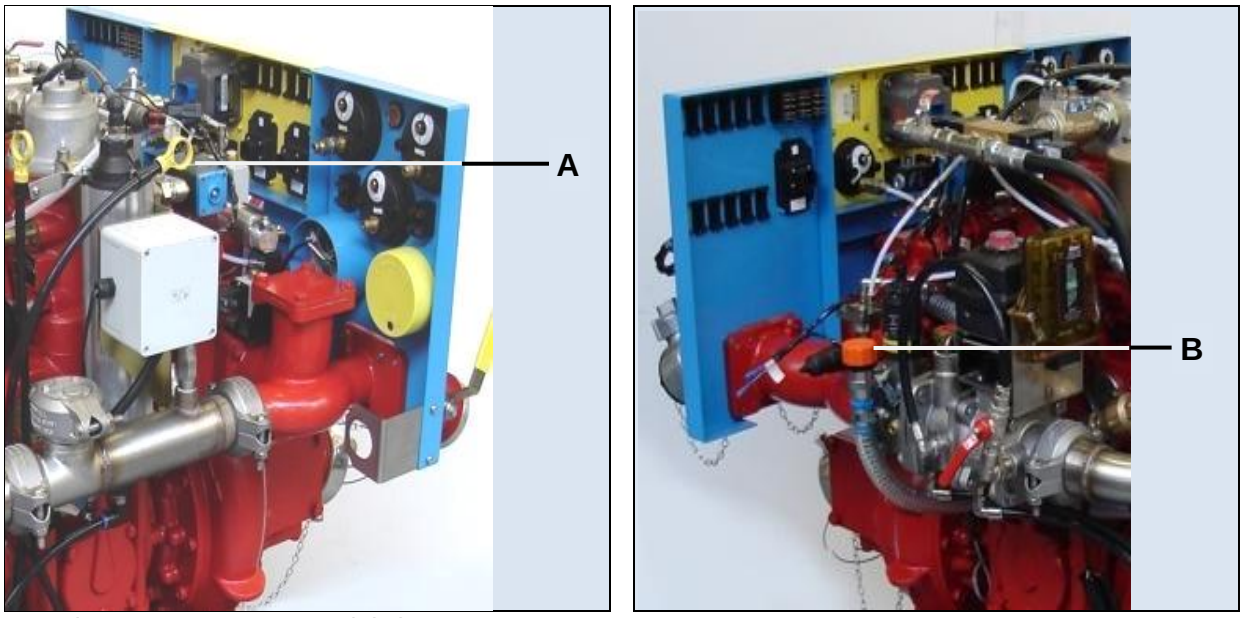
FREQUENCY	**EVERY 3 MONTHS**	**Back to Schedule**
EQUIPMENT	**Pumps PC1_ / PC2_ Gearbox**	

CHECK THE PUMP AND GEARBOX OIL LEVELS

CHECK THE PUMP OIL LEVEL – Prima SmartCAFS50,100

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



Prima SmartCAFS50 model shown.

1. Check the pump oil level only when the vehicle is stationary and level. If the pump has been running, wait five minutes for the oil level to stabilise and allow sufficient time for the pump to cool.
2. Remove the dipstick (A) and clean with a lint-free cloth.
3. Replace the dipstick. Again, remove the dipstick and check the oil level. Oil should show between the upper and lower marks on the dipstick.
4. If required, remove the oil filler cap (B) and top up with approved oil. Refer to Approved Lubricants in Section 5, Maintenance.
5. Replace the dipstick and oil filler cap.

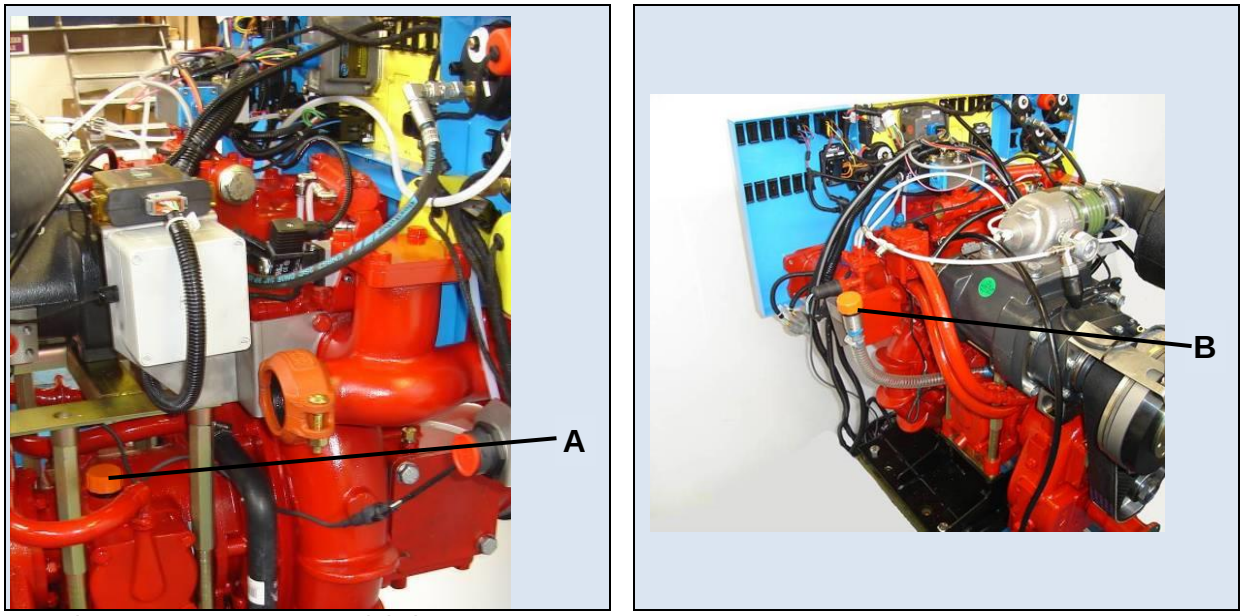
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CHECK THE PUMP OIL LEVEL – Prima SmartCAFS200

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



Prima SmartCAFS200 model shown.

6. Check the pump oil level only when the vehicle is stationary and level. If the pump has been running, wait five minutes for the oil level to stabilise and allow sufficient time for the pump to cool.
7. Remove the dipstick (A) and clean with a lint-free cloth.
8. Replace the dipstick. Again, remove the dipstick and check the oil level. Oil should show between the upper and lower marks on the dipstick.
9. If required, remove the oil filler cap (B) and top up with approved oil. Refer to Approved Lubricants in Section 5, Maintenance.
10. Replace the dipstick and oil filler cap.

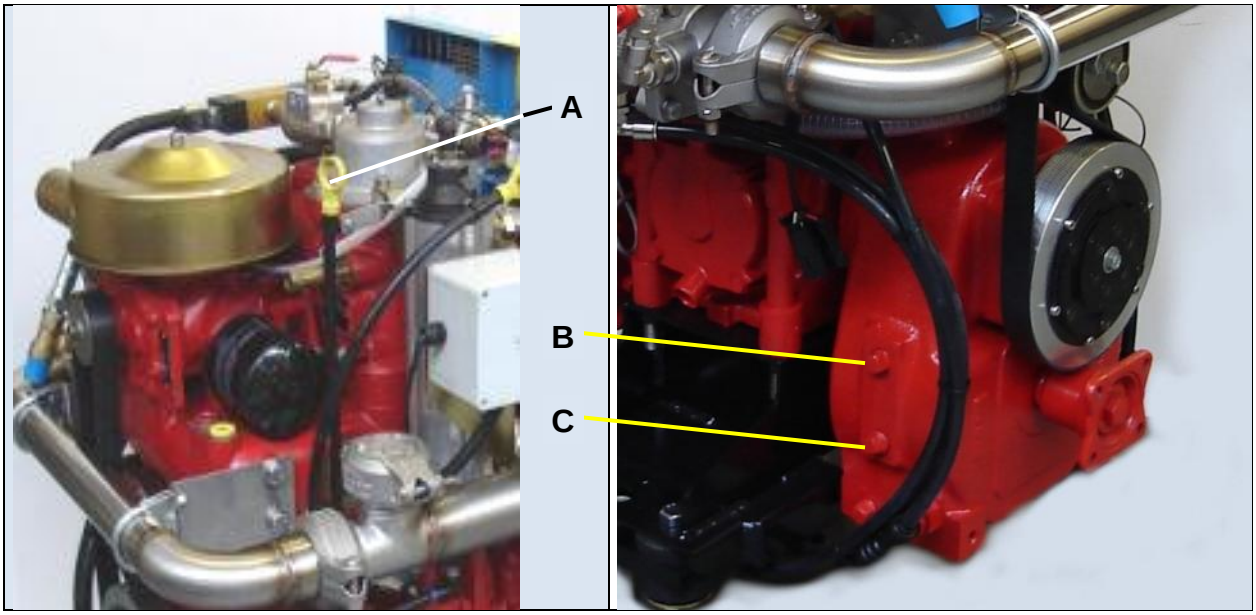
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CHECK THE GEARBOX OIL LEVEL – Prima SmartCAFS50, 100, 200

Note: Certain earlier pump models are fitted with a dipstick to check the gearbox oil level. Later models use the oil level plug on the side of the gearbox.

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



Prima SmartCAFS50 model shown.

1. If dipstick is fitted (early models) –
2. Check the gearbox oil level only when the vehicle is stationary and level. If the pump has been running, wait five minutes for the oil level to stabilise and allow sufficient time for cooling.
3. Remove the dipstick (A) and clean with a lint-free cloth.
4. Replace the dipstick. Again, remove the dipstick and check the oil level. Oil should show between the upper and lower marks on the dipstick.
5. If required, remove the oil filler plug (B) and top up with approved oil using a suitable funnel. Refer to Approved Lubricants in Section 5, Maintenance.
6. When oil level is correct, replace the oil filler plug and dipstick.

If dipstick is not fitted (later models) -

7. Check that the oil level is up to the level of the plug (C).
8. If required, remove the oil filler plug (B) and top up with approved oil using a suitable funnel. Refer to Approved Lubricants in Section 5, Maintenance.
9. When oil level is correct, replace the oil plugs (B) and (C).

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PREVENTIVE MAINTENANCE PROCEDURE
PM-002

FREQUENCY	**EVERY 3 MONTHS**	Back to Schedule
EQUIPMENT	**Pumps PC1_ / PC2_ All models**	

VACUUM TEST

Do this test to check for leaks in the system.



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT SURFACES WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

1. Install the blanking cap on the pump suction tube.
2. Close the discharge valves.
3. Run the pump at 1300-1500 rev/min and check the reading on the compound gauge.
4. When a vacuum of -0.81 bar is shown, stop the pump. This vacuum should be maintained for at least 15 seconds.
5. If the pump will not hold this vacuum, a leak is present in the pump, and a Pressure Test must be done to identify the leak. Refer to Corrective Maintenance Procedure CM-007.
6. If the pump does not reach -0.81 bar but maintains a lower pressure, a priming system fault is indicated. Do the checks that follow:
   - Check that the primer drive clutch is engaged.
7. If the pump does not reach -0.81 bar and will not maintain that lower pressure, there is a leak and possibly a fault in the priming system.

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PREVENTIVE MAINTENANCE PROCEDURE
PM-003

FREQUENCY	**EVERY 3 MONTHS**	Back to Schedule
EQUIPMENT	**Pump PC2_ Only**	

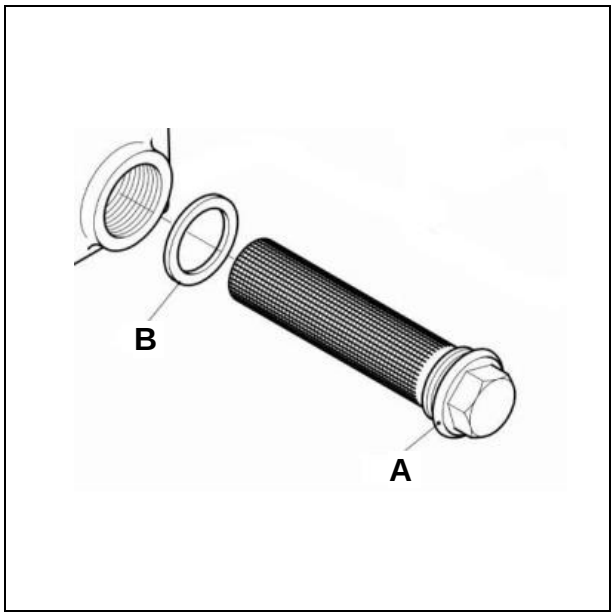
HIGH PRESSURE FILTER

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



Prima SmartCAFS50 model shown.



Parts Required	Part No.	Qty	These parts are available in a service kit
(B) Bonded Seal	UFP 2303/15	1	

The high pressure filter limits particle size that can reach the pump high pressure stage. Flow through the high pressure filter passes from the outside to the inside. Much of the debris is then removed from the outer surface and returned to the low pressure volute.

1. Unscrew the filter (A) with a 38mm A/F (1½in) spanner.
2. Remove the filter from the housing and discard bonded seal (B).
3. Flush the filter with clean water to remove all debris. The strainer may be damaged during cleaning, so take care when handling. Replace if damaged.
4. Apply grease to the threads of the oil filter. Install filter (A) complete with new bonded seal (B). Do not over tighten the filter.

IDEX FIRE SUPPRESSION GROUP

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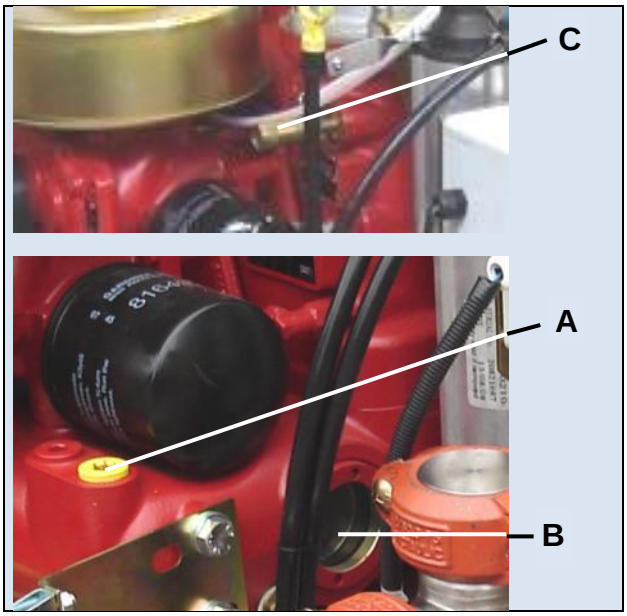
PREVENTIVE MAINTENANCE PROCEDURE
PM-004

FREQUENCY	**EVERY 3 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Tempest 3**	

CHECK OIL LEVEL AND 15 MINUTE RUNNING – Tempest 3

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



1. Check the compressor oil level only when the vehicle is stationary and level. Run the compressor for 15 minutes to remove any water that may be entrained with the oil, wait five minutes for the oil level to stabilise and allow sufficient time for the compressor to cool.
2. The compressor oil level is indicated in the sight glass (B) which is located behind the CAFS discharge connection.
3. The oil level should be at the mid-point on the sight glass.
4. Open the safety valve (C) cap four to five turns to vent internal pressure. Fully close the safety valve cap.
5. If required, remove the oil filler plug (A) and top up with approved oil. Refer to Approved Lubricants in Section 5, Maintenance.
6. Install the oil filler plug and tighten.
7. THE COMPRESSOR MUST BE RUN FOR 15 MINUTES EVEN IF OIL LEVEL IS CORRECT. THIS HELPS PREVENT SEIZING.

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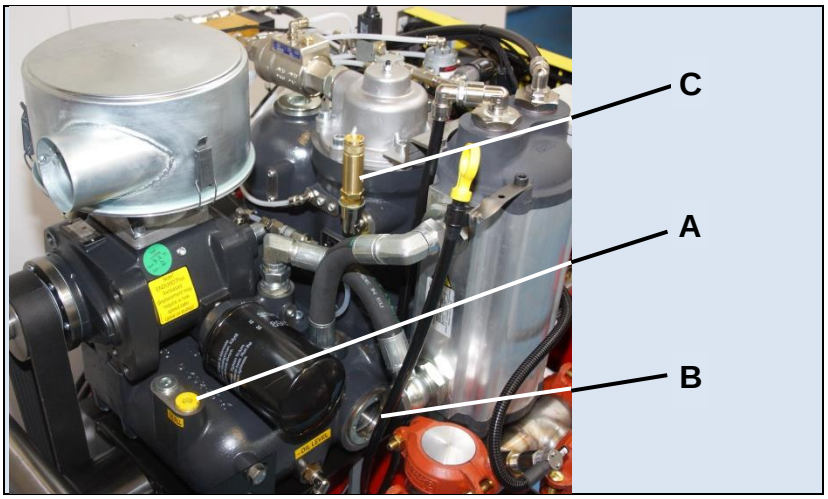
PREVENTIVE MAINTENANCE PROCEDURE
PM-004

FREQUENCY	**EVERY 3 MONTHS**	Back to Schedule
EQUIPMENT	**Compressor - Tempest 6**	

CHECK OIL LEVEL AND 15 MINUTE RUNNING – Tempest 6

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



8. Check the compressor oil level only when the vehicle is stationary and level. Run the compressor for 15 minutes to remove any water that may be entrained with the oil, wait five minutes for the oil level to stabilise and allow sufficient time for the compressor to cool.
9. The compressor oil level is indicated in the sight glass (B) which is located behind the CAFS discharge connection.
10. The oil level should be at the mid-point on the sight glass.
11. Open the safety valve (C) cap four to five turns to vent internal pressure. Fully close the safety valve cap.
12. If required, remove the oil filler plug (A) and top up with approved oil. Refer to Approved Lubricants in Section 5, Maintenance.
13. Install the oil filler plug and tighten.
14. THE COMPRESSOR MUST BE RUN FOR 15 MINUTES EVEN IF OIL LEVEL IS CORRECT. THIS HELPS PREVENT SEIZING.

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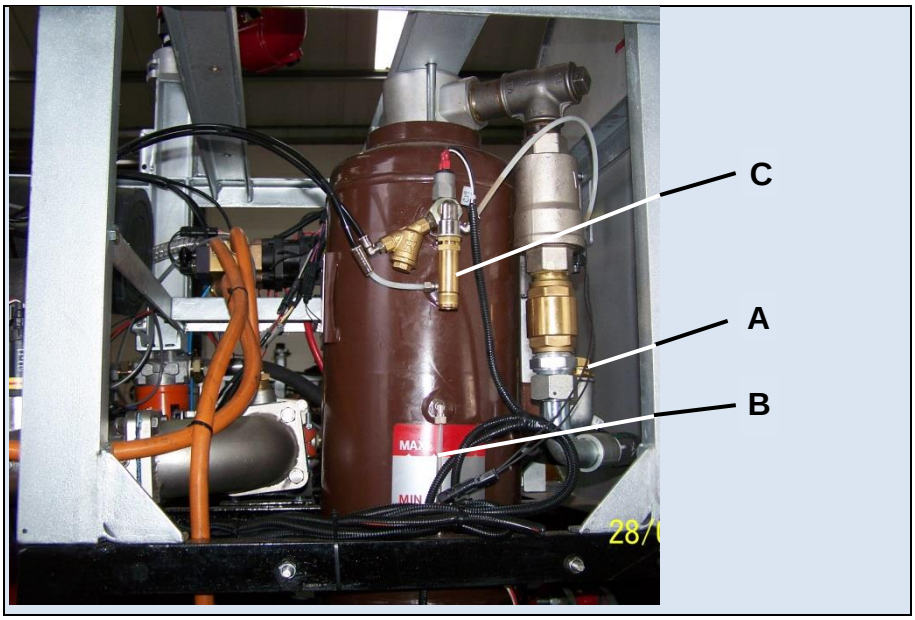
PREVENTIVE MAINTENANCE PROCEDURE
PM-004

FREQUENCY	**EVERY 3 MONTHS**	Back to Schedule
EQUIPMENT	**Compressor – Enduro 12**	

CHECK OIL LEVEL AND 15 MINUTE RUNNING – Enduro 12

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



15. Check the compressor oil level only when the vehicle is stationary and level. Run the compressor for 15 minutes to remove any water that may be entrained with the oil, wait five minutes for the oil level to stabilise and allow sufficient time for the compressor to cool.
16. The compressor oil level is indicated in the clear tube (B) which is located on the oil-water separator tank.
17. The oil level should be at the mid-point on the tube.
18. Open the safety valve (C) cap four to five turns to vent internal pressure. Fully close the safety valve cap.
19. If required, remove the oil filler plug (A) and top up with approved oil. Refer to Approved Lubricants in Section 5, Maintenance.
20. Install the oil filler plug and tighten.
21. THE COMPRESSOR MUST BE RUN FOR 15 MINUTES EVEN IF OIL LEVEL IS CORRECT. THIS HELPS PREVENT SEIZING.

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PREVENTIVE MAINTENANCE PROCEDURE

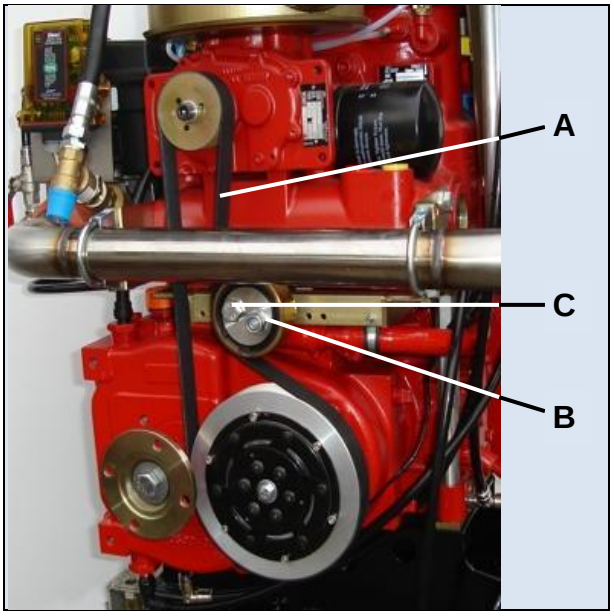
PM-005

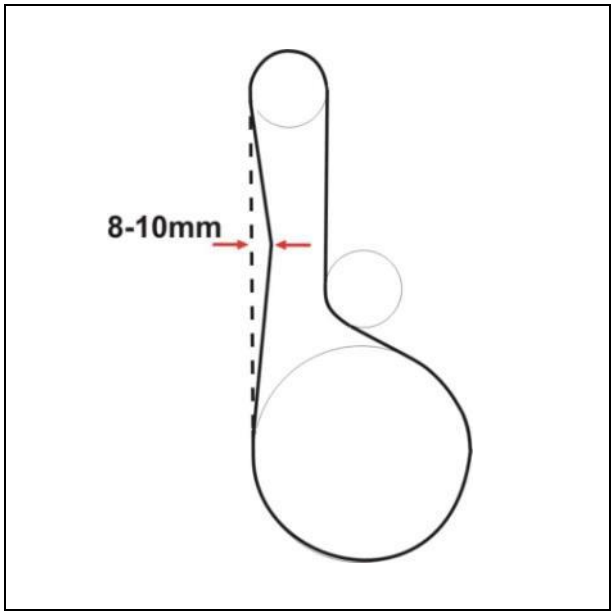
FREQUENCY	**EVERY 3 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Tempest 3**	

CHECK THE COMPRESSOR DRIVE BELT – Tempest 3

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





1. Check the condition and the tension of the drive belt (A). The belt must be replaced if it is damaged, cracked or contaminated.
2. Loosen the tensioner nut (B).
3. If belt is not serviceable, remove the belt and install a new *Polydrive* 12PJ ribbed belt as directed in procedure PM-020. Make sure that the belt aligns uniformly on the pulleys.
4. The tensioner is loosened with the nut (B) and adjusted with the screw (C).
5. Rotate the tensioner to achieve an 8 -10mm deflection with a 10kg load applied at mid-span.
6. Tighten the tensioner screw (C).

Optical Belt Tension Meter

If an optical belt tension meter is available, e.g. the Clavis Optical Belt Tensioner, then the belt can be tightened correctly by measuring the vibration frequency. Follow these steps –

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1. Tighten the belt so it is reasonably taut.
2. Operate the optical belt tensioner according to the manufacturer's instructions. The device will register a frequency reading when the belt has been tapped. It is recommended several reading are taken to obtain a representative figure.
3. For the Prima SmartCAFS50 belt the frequency setting must be 79 Hz.
4. If the measured frequency is too low, tighten the belt via the tensioner.
5. If the measured frequency is too high, loosen the belt via the tensioner.
6. Take another reading to confirm the frequency is 79 Hz.

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PREVENTIVE MAINTENANCE PROCEDURE

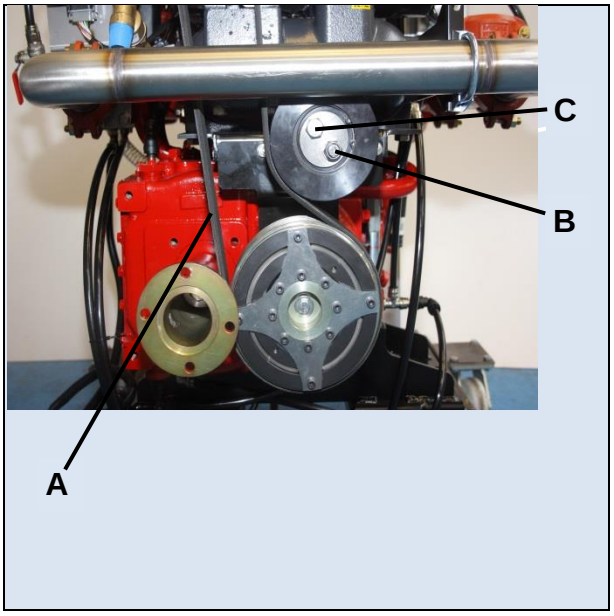
PM-005

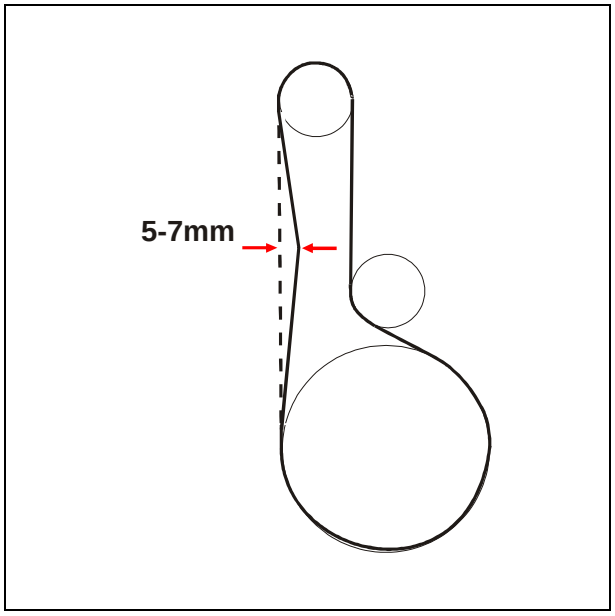
FREQUENCY	**EVERY 3 MONTHS**	Back to Schedule
EQUIPMENT	**Compressor – Tempest 6**	

CHECK THE COMPRESSOR DRIVE BELT – Tempest 6

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





7. Check the condition and the tension of the drive belt (A). The belt must be replaced if it is damaged, cracked or contaminated.
8. Loosen the tensioner nut (B).
9. If belt is not serviceable, remove the belt and install a new *Polydrive* 9 PL 1270. ribbed belt as directed in procedure PM-020. Make sure that the belt aligns uniformly on the pulleys.
10. The tensioner is loosened with the nut (B) and adjusted with the screw (C).
11. Rotate the tensioner to achieve an 5 - 7 mm deflection with a 10kg load applied at mid-span.
12. Tighten the tensioner screw (C).

Optical Belt Tension Meter

If an optical belt tension meter is available, e.g. the Clavis Optical Belt Tensioner, then the belt can be tightened correctly by measuring the vibration frequency. Follow these steps –

FIRE SUPPRESSION GROUP

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1. Tighten the belt so it is reasonably taut.
2. Operate the optical belt tensioner according to the manufacturer's instructions. The device will register a frequency reading when the belt has been tapped.
3. It is recommended several readings are taken to obtain a representative figure.
4. For the Prima SmartCAFS100 belt the frequency setting must be 65 Hz.
5. If the measured frequency is too low, tighten the belt via the tensioner.
6. If the measured frequency is too high, loosen the belt via the tensioner.
7. Take another reading to confirm the frequency is 65 Hz.

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PREVENTIVE MAINTENANCE PROCEDURE

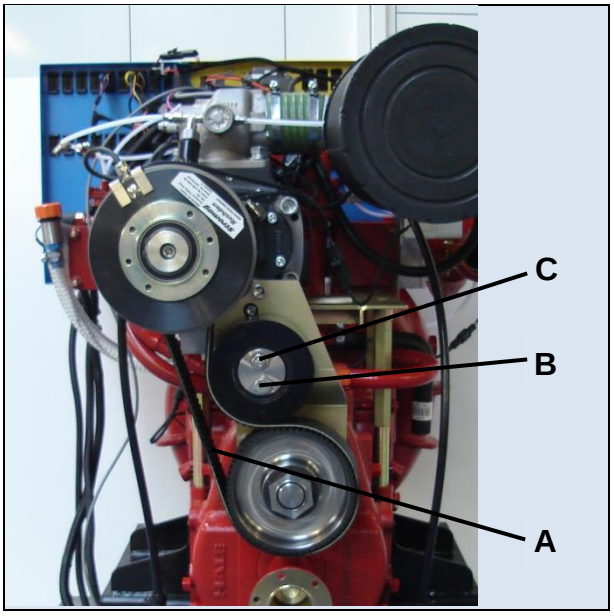
PM-005

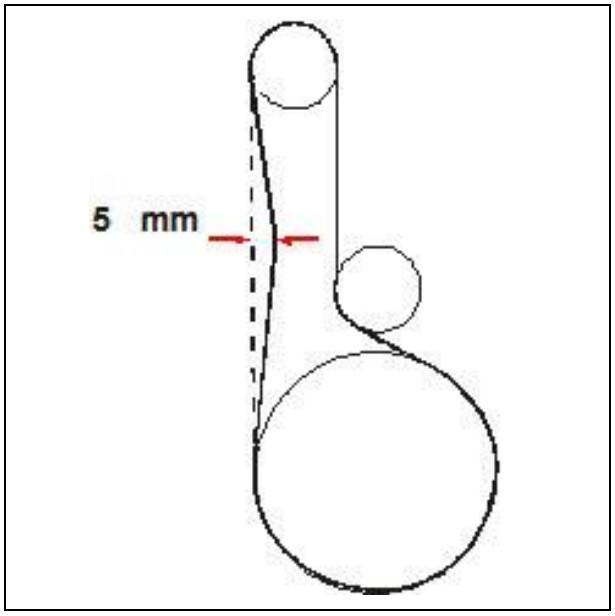
FREQUENCY	**EVERY 3 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Enduro 12**	

CHECK THE COMPRESSOR DRIVE BELT – Enduro 12

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





13. Check the condition and the tension of the drive belt (A). The belt must be replaced if it is damaged, cracked or contaminated.
14. Loosen the tensioner nut (B).
15. If belt is not serviceable, remove the belt and install a new Goodyear Eagle PD synchronous drive belt as directed in procedure PM-020. Make sure that the belt aligns uniformly on the pulleys.
16. The tensioner is loosened with the nut (B) and adjusted with the screw (C).
17. Rotate the tensioner to achieve a 5mm deflection with a load of 145N (new belt) or 108N (used belt).
18. Tighten the tensioner screw (C).

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Optical Belt Tension Meter

If an optical belt tension meter is available, e.g. the Clavis Optical Belt Tensioner, then the belt can be tightened correctly by measuring the vibration frequency. Follow these steps –

1. Tighten the belt so it is reasonably taut.
2. Operate the optical belt tensioner according to the manufacturer's instructions. The device will register a frequency reading when the belt has been tapped.
3. It is recommended several readings are taken to obtain a representative figure.
4. For the Prima SmartCAFS200 belt the frequency setting must be 128 Hz.
5. If the measured frequency is too low, tighten the belt via the tensioner.
6. If the measured frequency is too high, loosen the belt via the tensioner.

Take another reading to confirm the frequency is 128 Hz.

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PREVENTIVE MAINTENANCE PROCEDURE
PM-006

FREQUENCY	**EVERY 3 MONTHS**	**Back to Schedule**
EQUIPMENT	**FoamLogix 2.1A, 3.3, 5.0, 6.5**	

CHECK FOAM PIPE CONNECTIONS



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

Inspect all pipework and hoses for tightness, leaks and/or damage. Rectify as necessary.

For further information, refer to the System Plumbing Diagrams in the FoamLogix Installation and Operation Manual.

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PREVENTIVE MAINTENANCE PROCEDURE
PM-007

FREQUENCY	**EVERY 3 MONTHS**	**Back to Schedule**
EQUIPMENT	**FoamLogix 2.1A, 3.3, 5.0, 6.5**	

OPERATING THE FOAMLOGIX SYSTEM



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

If an approved foam concentrate has been left in the system without use for three months, operate the FoamLogix foam system in bypass mode to move the foam concentrate residue and to prevent gelling.

Refer to the FoamLogix Installation and Operations Manual in Section 11, Appendix.

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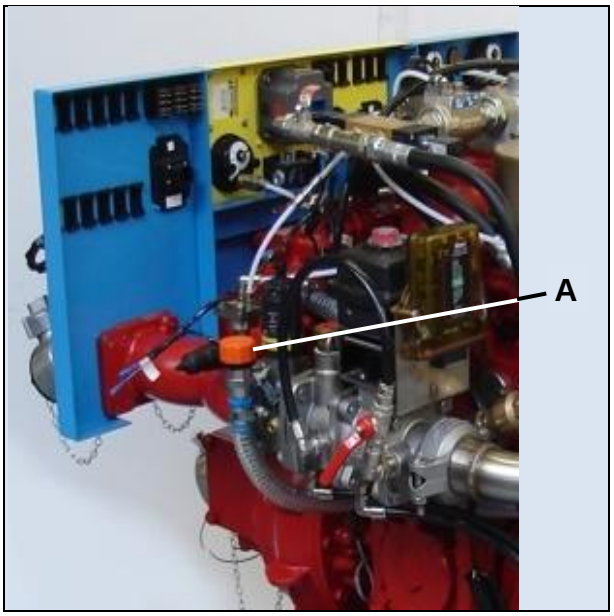
PREVENTIVE MAINTENANCE PROCEDURE
PM-008

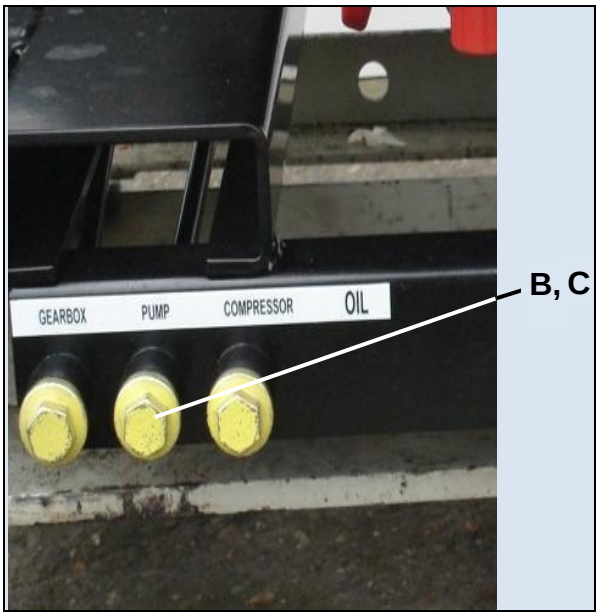
FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**Pumps PC1_ / PC2_ CAFS50, 100**	

CHANGE THE BEARING HOUSING OIL

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT AND LUBRICANT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(C) Bonded Seal	UFP 2303/08	1	

1. If the equipment has been operating, first let it cool down.
2. Remove the oil filler cap (A).

WARNING! BEFORE DISPOSING OF WASTE LUBRICANT, REFER TO THE GUIDELINES IN ENVIRONMENTAL PROTECTION.

3. At the front of the pump, remove the pump drain plug (B). Drain the oil into a suitable container ready for disposal. Discard the drain plug bonded seal (C).
4. Install the drain plug complete with new bonded seal.
5. Fill the pump with approved oil to the correct level indicated on the dipstick as instructed in procedure PM-001. For oil type and capacity, refer to Approved Lubricants in Section 5, Maintenance.
6. Install the oil filler cap (A) and tighten.

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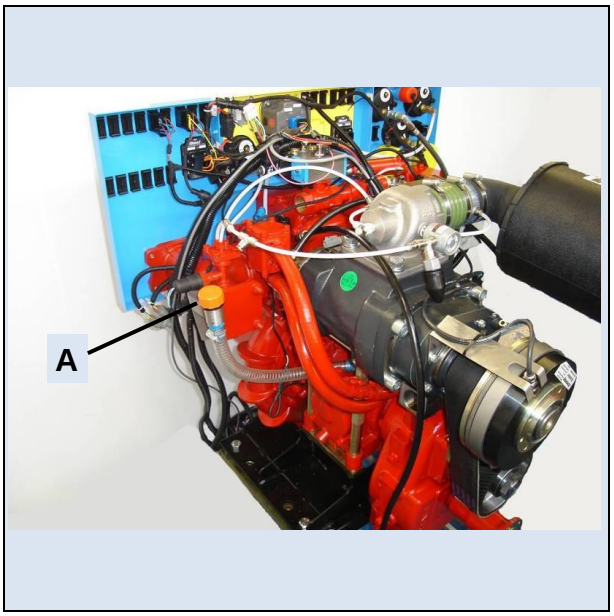
PREVENTIVE MAINTENANCE PROCEDURE
PM-008

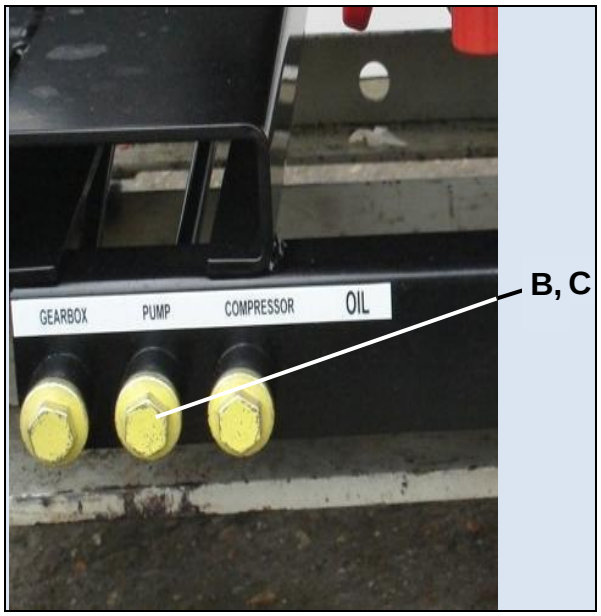
FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**Pumps PC1_ / PC2_ CAFS200**	

CHANGE THE BEARING HOUSING OIL

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT AND LUBRICANT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(C) Bonded Seal	UFP 2303/08	1	

7. If the equipment has been operating, first let it cool down.
8. Remove the oil filler cap (A).

WARNING! BEFORE DISPOSING OF WASTE LUBRICANT, REFER TO THE GUIDELINES IN ENVIRONMENTAL PROTECTION.

9. At the front of the pump, remove the pump drain plug (B). Drain the oil into a suitable container ready for disposal. Discard the drain plug bonded seal (C).
10. Install the drain plug complete with new bonded seal.
11. Fill the pump with approved oil to the correct level indicated on the dipstick as instructed in procedure PM-001. For oil type and capacity, refer to Approved Lubricants in Section 5, Maintenance.
12. Install the oil filler cap (A) and tighten.

IDEX FIRE SUPPRESSION GROUP

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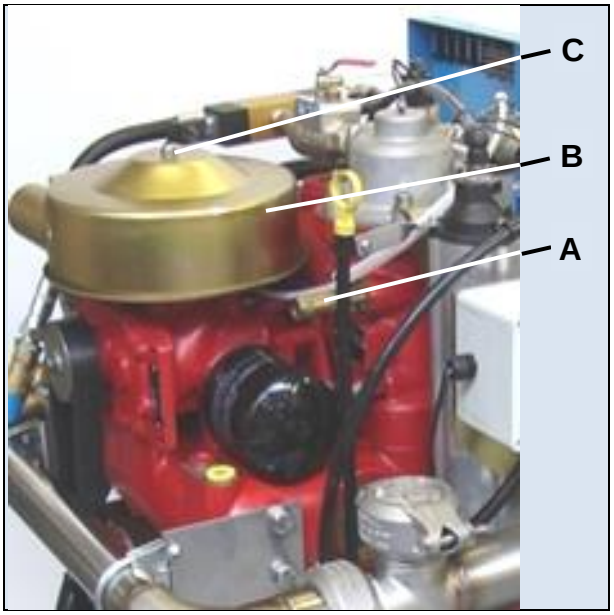
PREVENTIVE MAINTENANCE PROCEDURE
PM-009

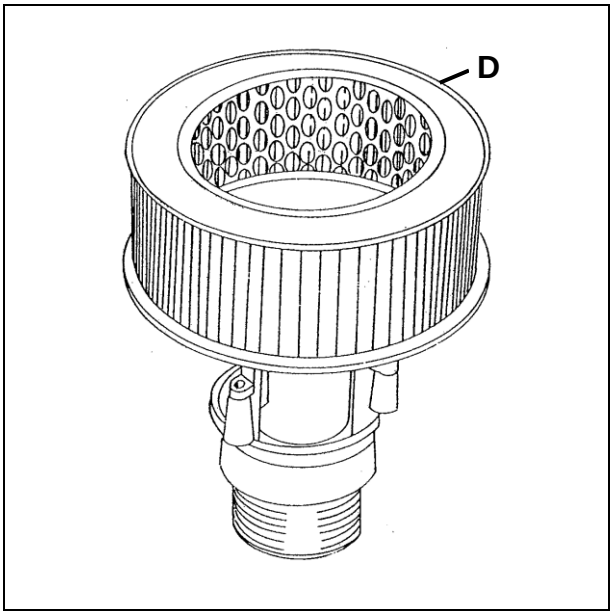
FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Tempest 3**	

CHANGE THE COMPRESSOR AIR FILTER – Tempest 3

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(D) Air Filter	59271	1	

1. Open the safety valve (A) cap four to five turns to vent internal pressure. Fully close the safety valve cap.
2. Make sure that no debris can get into the intake as it could damage the compressor.
3. Remove the filter cover (B). Note that the filter cover is secured by a wing nut (C) that retains a spring loaded valve on the inside of the cover.
4. Remove and discard the air filter element (D).
5. Install the new air filter element (D).
6. Install the filter cover (B) and secure with the wing nut (C). Make sure that the spring loaded valve is seated squarely.

FIRE SUPPRESSION GROUP

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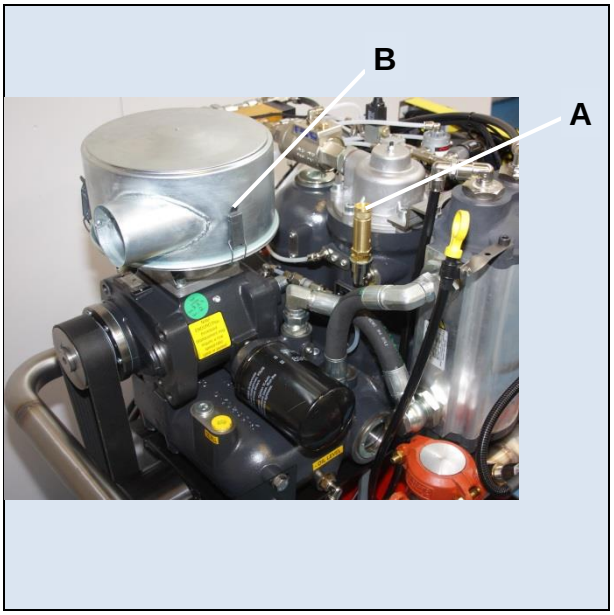
PREVENTIVE MAINTENANCE PROCEDURE
PM-009

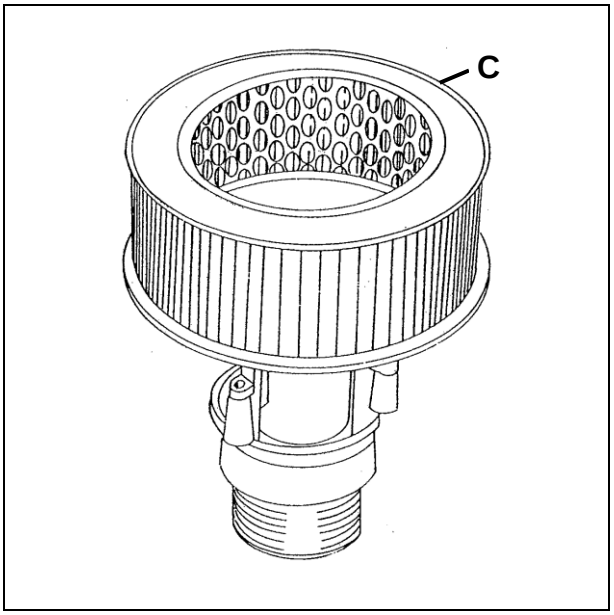
FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Tempest 6**	

CHANGE THE COMPRESSOR AIR FILTER – Tempest 6

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(C) Air Filter	TAM-81166609	1	

7. Open the safety valve (A) cap four to five turns to vent internal pressure. Fully close the safety valve cap.
8. Make sure that no debris can get into the intake as it could damage the compressor.
9. Remove the filter cover (B) by releasing the clips on the side of the cover.
10. Remove and discard the old air filter element (C).
11. Install the new air filter element (C).
12. Install the filter cover (B) and secure with the side clips.

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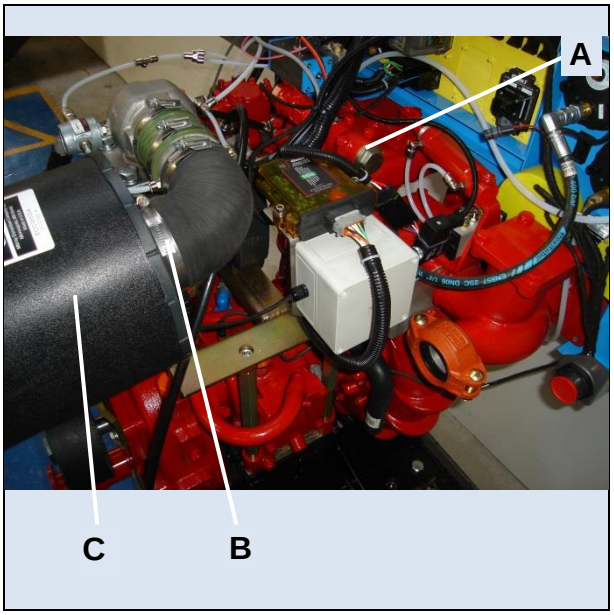
PREVENTIVE MAINTENANCE PROCEDURE
PM-009

FREQUENCY	**EVERY 12 MONTHS**	Back to Schedule
EQUIPMENT	**Compressor – Enduro 12**	

CHANGE THE COMPRESSOR AIR FILTER – Enduro 12

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



Parts Required	Part No.	Qty	These parts are available in a service kit
(C) Air Filter	010-0690-00-0	1	

13. Open the safety valve (A) cap four to five turns to vent internal pressure. Fully close the safety valve cap.
14. Make sure that no debris can get into the intake as it could damage the compressor.
15. Remove the filter (B) by undoing the clip retaining the filter to the compressor air intake.
16. Remove and discard the old air filter element (C).
17. Install the new air filter element (C).

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PREVENTIVE MAINTENANCE PROCEDURE

PM-010

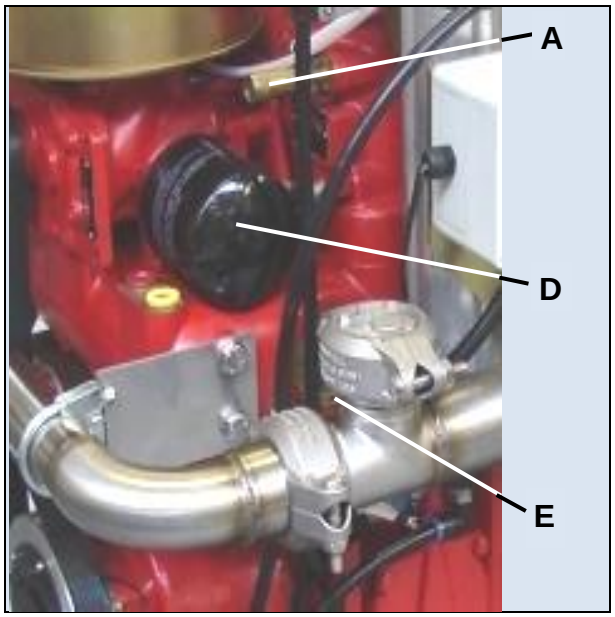
FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Tempest 3**	

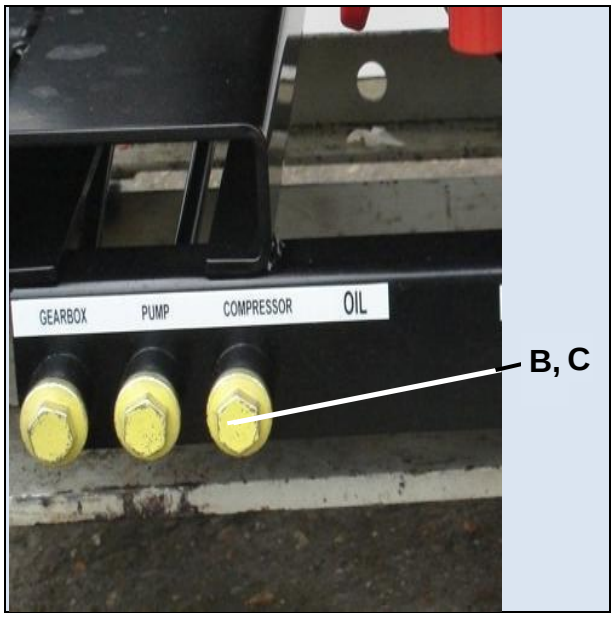
CHANGE THE COMPRESSOR OIL AND OIL FILTER – Tempest 3

Note: the oil filter (D) is designed to withstand high pressure, always use this type of filter. Do not use other types of filter.

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT AND LUBRICANT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(C) Bonded Seal	UFP 2303/08	1	
(D) Oil Filter	59271/01	1	

1. Open the safety valve (A) cap four to five turns to vent internal pressure. Fully close the safety valve cap.

WARNING! BEFORE DISPOSING OF WASTE LUBRICANT, REFER TO THE GUIDELINES IN ENVIRONMENTAL PROTECTION.

2. At the front of the pump, remove the compressor drain plug (B) and drain the oil into a suitable container for disposal. Discard the bonded seal (C).
3. Using a strap wrench, remove the oil filter (D) and discard it. Lubricate the seal on the new oil filter. Install the new filter. Install the compressor drain plug (B) complete with new bonded seal (C). Do not damage the air scavenge union next to the filter.
4. Fill the compressor with approved oil to the correct level. This is mid-point on the sight glass (E). For oil type and capacity, refer to Approved Lubricants in Section 5, Maintenance. Install the oil filler plug and tighten.

FIRE SUPPRESSION GROUP

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PREVENTIVE MAINTENANCE PROCEDURE

PM-010

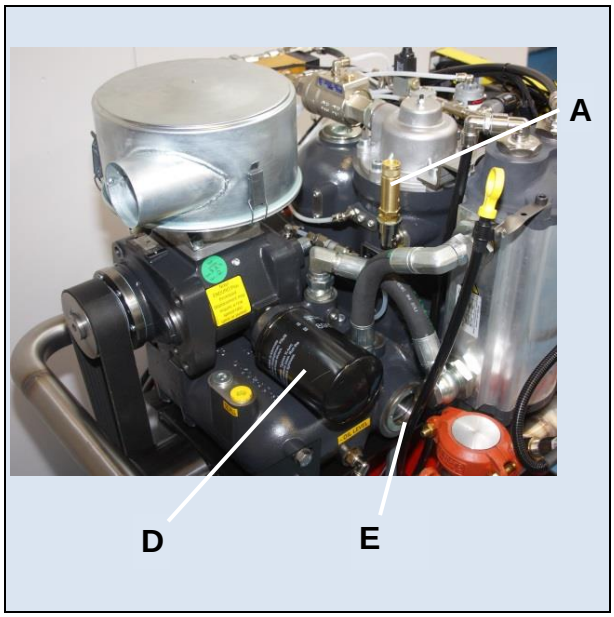
FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Tempest 6**	

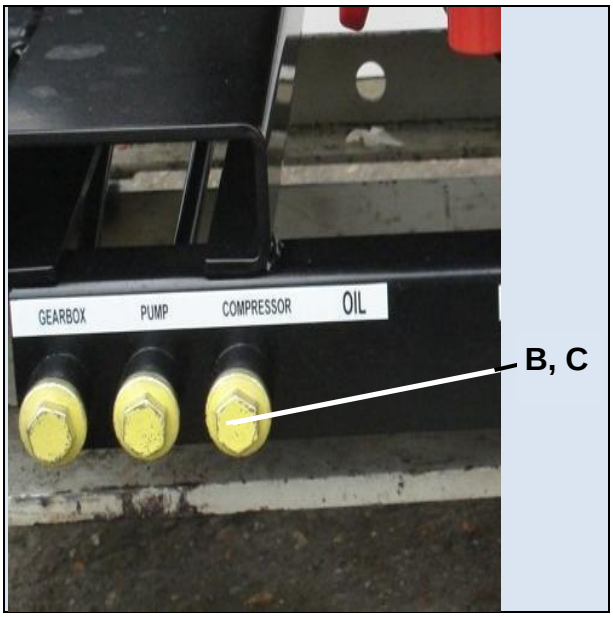
CHANGE THE COMPRESSOR OIL AND OIL FILTER – Tempest 6

Note: the oil filter (D) is designed to withstand high pressure, always use this type of filter. Do not use other types of filter.

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT AND LUBRICANT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(C) Bonded Seal	UFP 2303/08	1	
(D) Oil Filter	59271/01	1	

2. Open the safety valve (A) cap four to five turns to vent internal pressure. Fully close the safety valve cap.

WARNING! BEFORE DISPOSING OF WASTE LUBRICANT, REFER TO THE GUIDELINES IN ENVIRONMENTAL PROTECTION.

5. At the front of the pump, remove the compressor drain plug (B) and drain the oil into a suitable container for disposal. Discard the bonded seal (C).
6. Using a strap wrench, remove the oil filter (D) and discard it. Lubricate the seal on the new oil filter. Install the new filter. Install the compressor drain plug (B) complete with new bonded seal (C). Do not damage the air scavenge union next to the filter.
7. Fill the compressor with approved oil to the correct level. This is mid-point on the sight glass (E). For oil type and capacity, refer to Approved Lubricants in Section 5, Maintenance. Install the oil filler plug and tighten.

FIRE SUPPRESSION GROUP

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PREVENTIVE MAINTENANCE PROCEDURE

PM-010

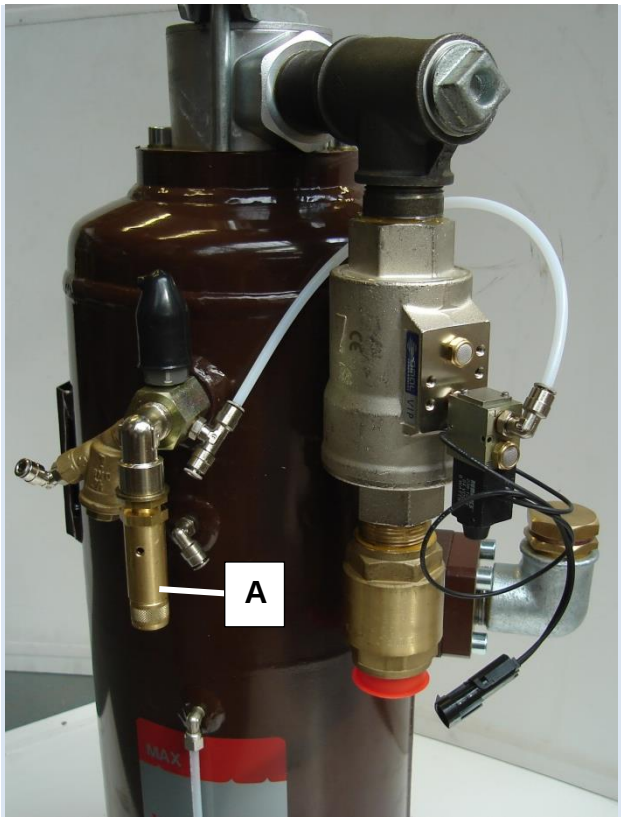
FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Enduro 12**	

CHANGE THE COMPRESSOR OIL AND OIL FILTER – Enduro 12

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT AND LUBRICANT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

WARNING! BEFORE DISPOSING OF WASTE LUBRICANT, REFER TO THE GUIDELINES IN ENVIRONMENTAL PROTECTION.





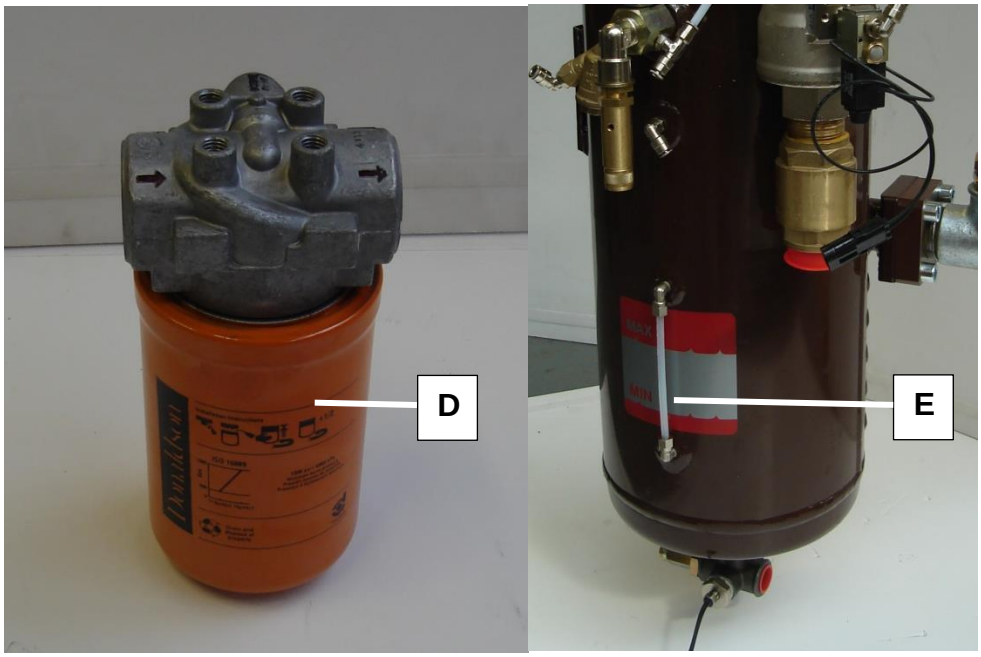
1. Open the safety valve (A) cap four to five turns to vent internal pressure. Fully close the safety valve cap

2. Open the oil drain valve (B) at the bottom of the oil/water separator tank

3. Using a strap wrench, remove the oil filter (D) and discard it. Lubricate the seal on the new oil filter. Install the new filter

4. Drain all the oil into a suitable container. Close the drain valve.

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8. Fill the compressor with approved oil to the correct level. This is mid-point on the sight glass (E). For oil type and capacity, refer to Approved Lubricants in Section 5, Maintenance. Install the oil filler plug and tighten.

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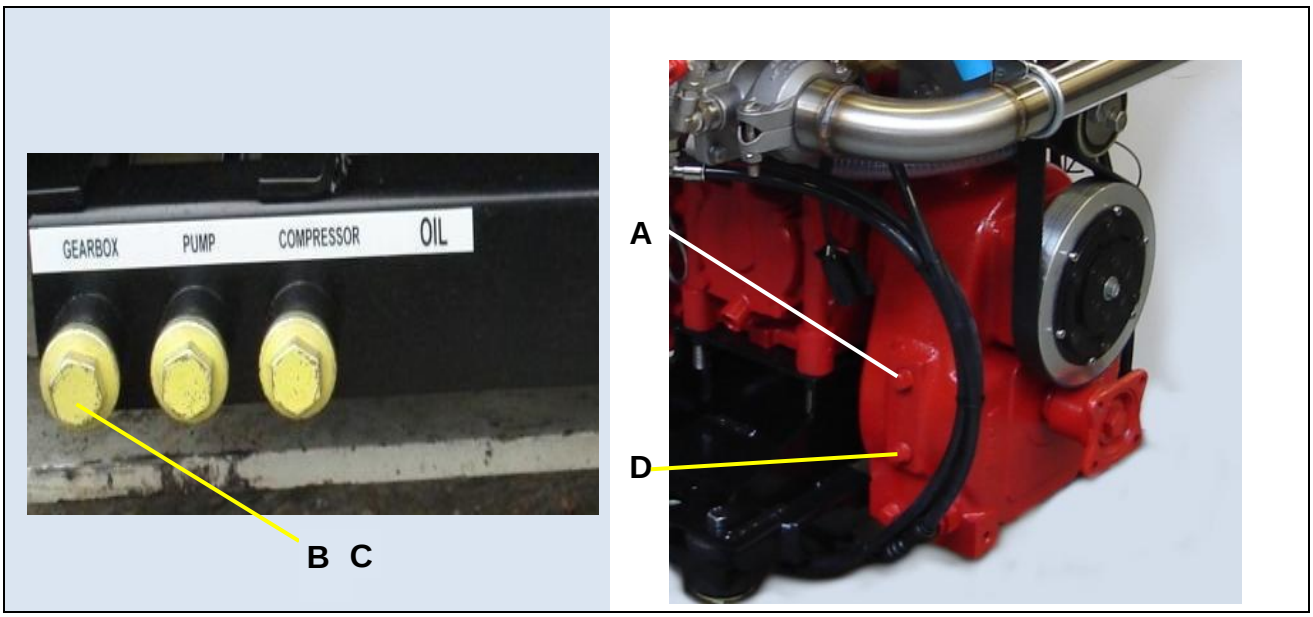
PREVENTIVE MAINTENANCE PROCEDURE
PM-011

FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**Gearbox – All Models**	

CHANGE THE GEARBOX OIL

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT AND LUBRICANT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



Parts Required	Part No.	Qty	These parts are available in a service kit
(C) Bonded Seal	UFP 2303/08	1	

1. Remove the oil filler plug (A). Make sure that no debris or dust enters the gearbox.

WARNING! BEFORE DISPOSING OF WASTE LUBRICANT, REFER TO THE GUIDELINES IN ENVIRONMENTAL PROTECTION.

2. At the front of the pump, remove the gearbox drain plug (B). Drain the oil into a suitable container ready for disposal. Discard the drain plug seal (C).
3. Install the drain plug (B) complete with new seal (C).
4. Using a suitable funnel, fill the gearbox with approved oil until the oil is level with the filler plug hole (D). For oil type and capacity, refer to Approved Oils in Section 5, Maintenance.
5. Apply Loctite 572 to the threads of the filler plug (A), level plug (D). Tighten the plug.

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PREVENTIVE MAINTENANCE PROCEDURE
PM-012

FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**FoamLogix 2.1A, 3.3, 5.0, 6.5**	

GENERAL INSPECTIONS



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

Electrical Inspections

1. Inspect all cable connections for tightness. **T**he cables are indexed so they connect to the correct receptacle one way only. DO NOT force mismatched connections as damage can result, causing system malfunction. Rectify as necessary.
2. Inspect wiring connections for corrosion or damage. Inspect the O-ring seal in the female connector. If the seal washer is missing or damaged, water can enter the connector causing corrosion, resulting in possible system failure. Rectify as necessary.
3. Check that the flow sensor cable is properly and securely connected to the main harness.

   For further information, refer to the Section 'Electrical' in the FoamLogix Installation and Operations Manual in Section 11, Appendix.

Pipework Inspections

1. Inspect all hoses and tubing for tightness, leaks and/or damage. Rectify as necessary.

   For further information, refer to the 'System Plumbing Diagrams' in the FoamLogix Installation and Operation Manual in Section 11, Appendix.

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PREVENTIVE MAINTENANCE PROCEDURE
PM-013

FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**FoamLogix 2.1A, 3.3, 5.0, 6.5**	

CLEANING THE FOAM STRAINER

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

IMPORTANT THE STRAINER/VALVE ASSEMBLY IS A LOW PRESSURE DEVICE. DO NOT USE FLUSHING WATER WITH A PRESSURE HIGHER THAN 3.5 BAR OR DAMAGE WILL RESULT.

The low pressure foam concentrate strainer / valve assembly is mounted at the inlet of the foam pump. The strainer protects the pump from debris that might accumulate in the foam concentrate tank.

The strainer / valve assembly has a composite non-metallic housing with stainless steel mesh strainer element and includes a shut-off valve for stopping the foam flow when doing maintenance.

For detailed information, refer to the FoamLogix Installation and Operations Manual in Section 11, Appendix.

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PREVENTIVE MAINTENANCE PROCEDURE
PM-014

FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**FoamLogix 2.1A, 3.3, 5.0, 6.5**	

VERIFY WATER FLOW CALIBRATION

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT SURFACES WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

IMPORTANT AN ACCURATE FLOW MEASURING DEVICE MUST BE USED TO MEASURE THE WATER FLOW WHEN CALIBRATING THE FLOW SENSOR. USE A SUITABLE SIZE, SMOOTH BORE NOZZLE AND AN ACCURATE AND CALIBRATED PITOT GAUGE INSTRUMENT.

WHEN MEASURING THE PRESSURE ENSURE IT IS MEASURED AT THE NOZZLE. NOZZLE FLOWRATE CHART DS353 (IN APPENDIX) WILL PROVIDE THE EXPECTED FLOWRATE AND PRESSURE FOR DIFFERENT SIZE NOZZLES.

This procedure verifies the calibration process and allows adjustments to the flow sensor display readings to allow for variations in piping configurations and the foam concentrate selected by the user.

Recalibration of the system may also be required after major repairs or component changes are made to the FoamLogix system.

Refer to the FoamLogix Installation and Operations Manual in Section 11, Appendix for the full Water Flow Calibration procedure.

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PREVENTIVE MAINTENANCE PROCEDURE
PM-015

FREQUENCY	**EVERY 12 MONTHS**	**Back to Schedule**
EQUIPMENT	**FoamLogix 2.1A, 3.3, 5.0, 6.5**	

VERIFY FOAM FEEDBACK CALIBRATION

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

IMPORTANT FOAM PUMP FEEDBACK IS CALIBRATED AFTER INSTALLATION TO VERIFY VALUES WITH THE ACTUAL FOAM CONCENTRATE(S) USED. ONLY CALIBRATE USING ACTUAL FOAM CONCENTRATES. DO NOT USE WATER, TRAINING OR TEST FOAMS FOR FEEDBACK CALIBRATION VERIFICATION.

This procedure verifies the calibration process and allows adjustments to the feedback sensor display readings to allow for variations in piping configurations and the foam concentrate selected by the user.

Recalibration of the system may also be required after major repairs or component changes are made to the FoamLogix foam system. Different viscosity foam concentrates may also require recalibration.

Refer to the FoamLogix Installation and Operations Manual in Section 11, Appendix for the full Foam Feedback Calibration Procedure.

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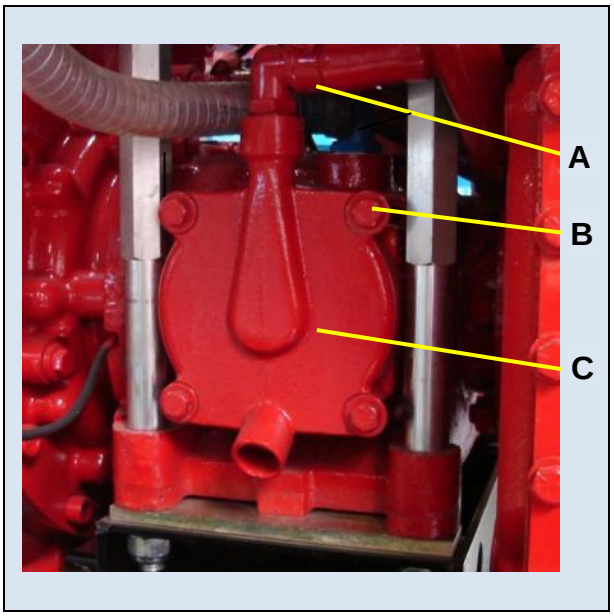
PREVENTIVE MAINTENANCE PROCEDURE
PM-016

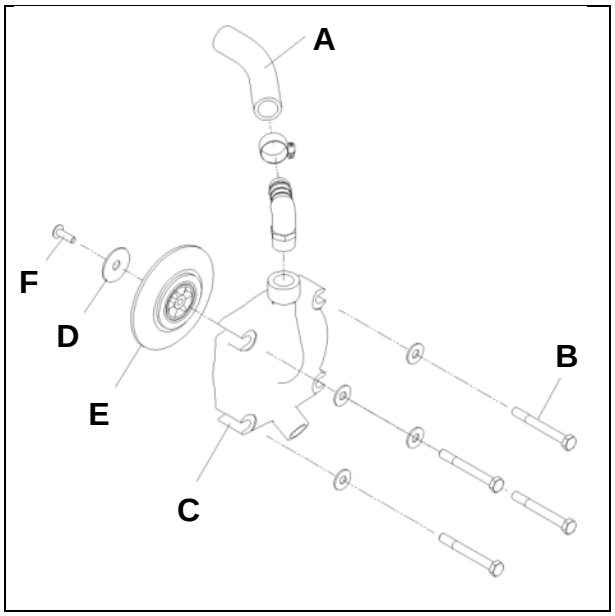
FREQUENCY	**EVERY 24 MONTHS**	Back to Schedule
EQUIPMENT	**Pumps PC1_ / PC2_**	

REPLACE THE PRIMER SEALS

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Primer End Cover

Parts Required	Part No.	Qty	These parts are available in a service kit
(D) Inlet Valve	65009	2	
(E) Outlet Valve	65008/002	2	

1. Disconnect the hose (A). The hose is more easily disconnected from the priming valve end rather than from the cover (C).
2. Remove four bolts (B) and washers. Remove the cover (C).
3. The rubber inlet (D) and outlet (E) valves must be changed.
4. To replace the valves, remove the screw (F). Remove the valves from the cover.
5. Clean the inside of the cover.
6. Install new valves in the cover. Apply Loctite 243 to the threads of the screw (F). Secure the valves with the screw.

…….continued on following page

IDEX FIRE SUPPRESSION GROUP

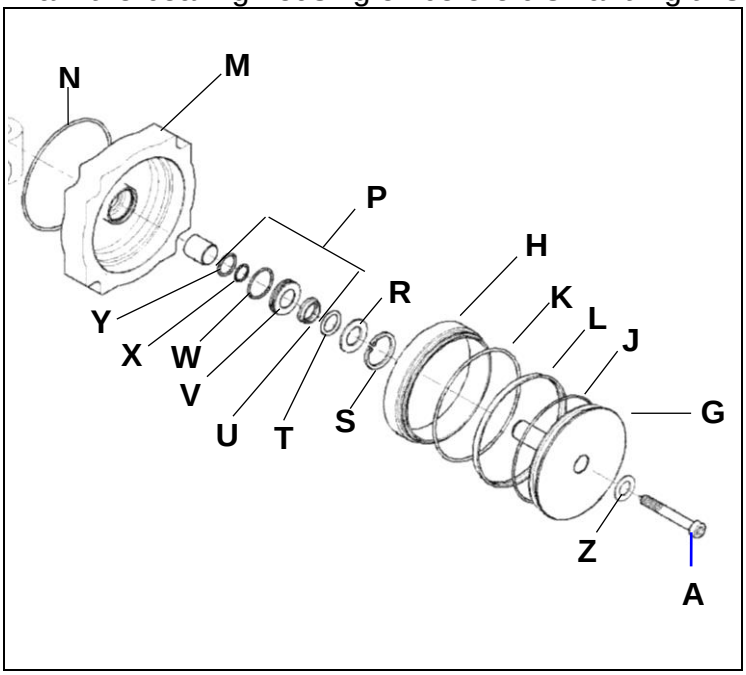
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PREVENTIVE MAINTENANCE PROCEDURE
PM-016

REPLACE THE PRIMER SEALS *continued*

Primer Piston and Cylinder

Drain the bearing housing oil before dismantling this assembly.

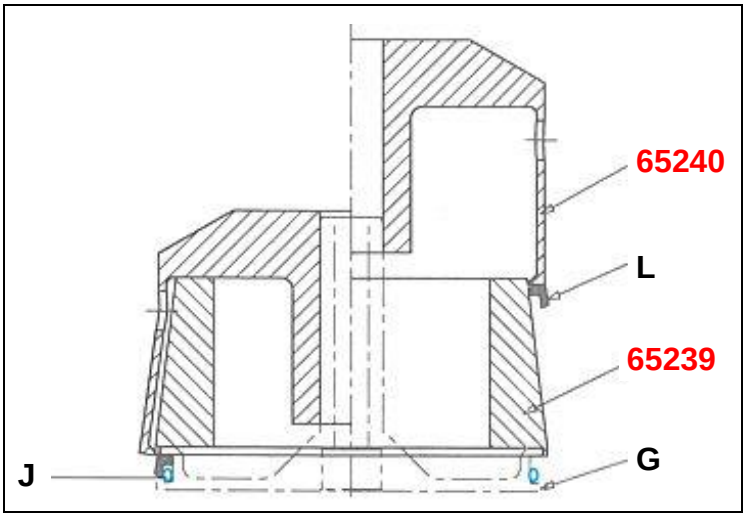


Qty	Parts Required	Part No.
These parts are available in a service kit.		
2	(J) 'O' Ring	65134
2	(K) 'O' Ring	61097
2	(L) Water Seal	65119
2	(N) 'O' Ring	61097
2	(T) 'O' Ring	65162
2	(U) Seal	65161
2	(W) 'O' Ring	52816
2	(X) Seal	65159
2	(Y) 'O' Ring	65160
2	(Z) Bonded Seal	MS133/8
2	(A) Screw	65169

Remove all seals and 'O' rings from the primer piston and cylinder. These parts must be discarded and replaced with new ones.

Special tools are required to enable correct assembly of the parts. These are listed in Special Tools for Primer Servicing in Section 5, Maintenance and are identified in the procedures that follow.

1. The piston (G) and cylinder liner (H) assembly comprise two 'O' rings (J and K) and a water seal (L). Remove and discard the 'O' rings and seal.
2. The new water seal (L) and 'O' ring (K) are best Installed using Piston Seal Assembly Tool 65239/65240 shown below.

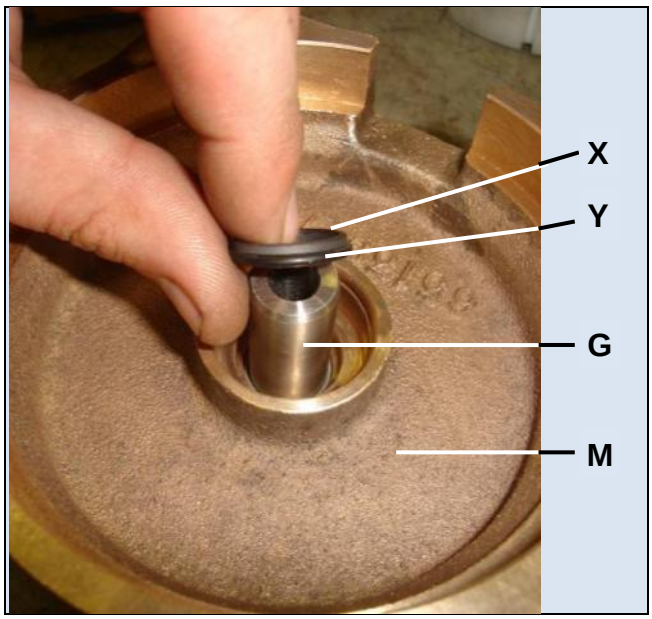


IDEX FIRE SUPPRESSION GROUP

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REPLACE THE PRIMER SEALS *continued*

3. Install ‘O’ ring (J) in the groove of the piston. This is a loose fit.
4. Cone Locator Tool 65239 sits on top of the piston (G), using the piston ring edge as a location guide.
5. Install water seal (L) over the cone locator at the narrow end. Position the water seal with it’s ‘O’ ring groove facing down, so the previously installed ‘O’ ring (J) can be accommodated. Use a small amount of water as lubrication around the seal and locator surfaces.
6. Position the Seal Expander Tool 65240 over the Cone Locator Tool with the outer edge pressing down on the water seal.
7. Press down on the Seal Expander Tool to force the water seal (L) down towards the piston groove. A final push will force the water seal into the piston groove to rest on top of the ‘O’ ring (J) already in the groove.
8. Remove the seal expander and cone locator tools.
9. Install a new ‘O’ ring (K) in the groove in the outside of the cylinder liner (H).
10. Install a new ‘O’ ring (N) in its groove in the cylinder (M).

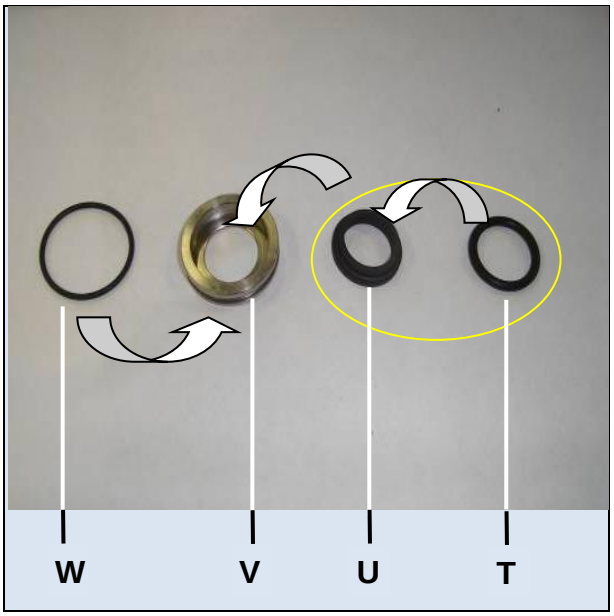


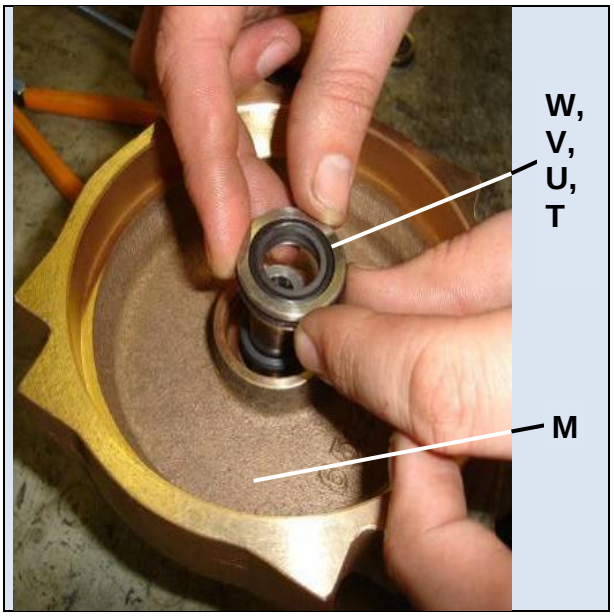
11. Install the seal (X) complete with ‘O’ ring (Y). Use the piston (G) shaft as a guidance tool by inserting it into the cylinder (M) at the reverse side to the working position. Note that the ‘O’ ring (Y) is pointing downwards when inserting into the cylinder.

IDEX FIRE SUPPRESSION GROUP

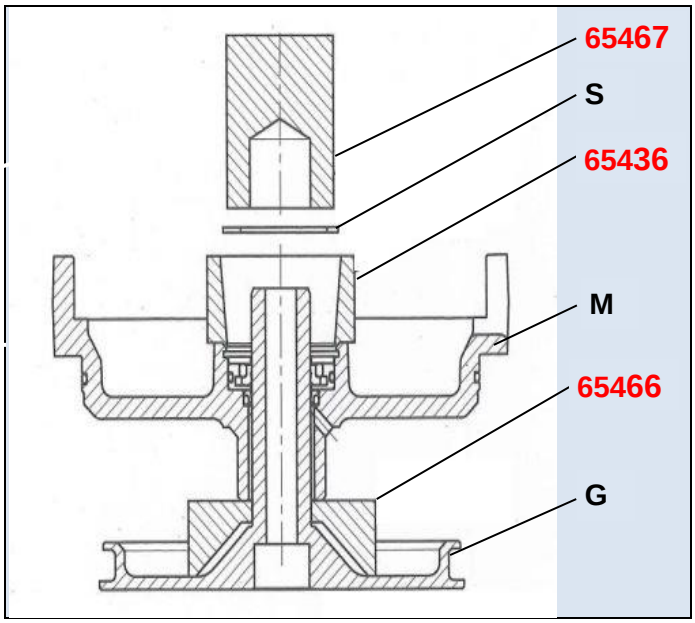
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REPLACE THE PRIMER SEALS *continued*





12. Assemble new 'O' rings and seal (W,U,T) onto the wiper carrier (V) as shown in the diagram above. Apply grease to 'O' ring (W) to assist insertion into the cylinder (M).
13. The 'O' ring and seal assembly (W,U,T), together with retaining disc (R) are inserted to the cylinder (M) using the Cylinder Support Tool (65466), Circlip Fitting Tool (65436) and Circlip Drift Tool (65467) shown below.

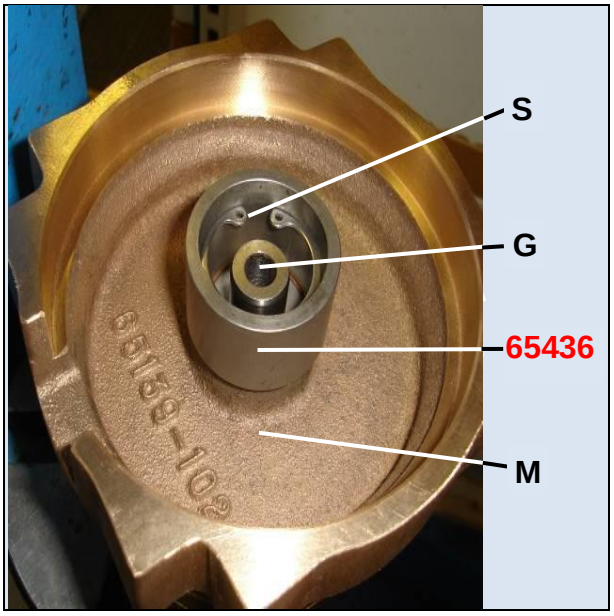


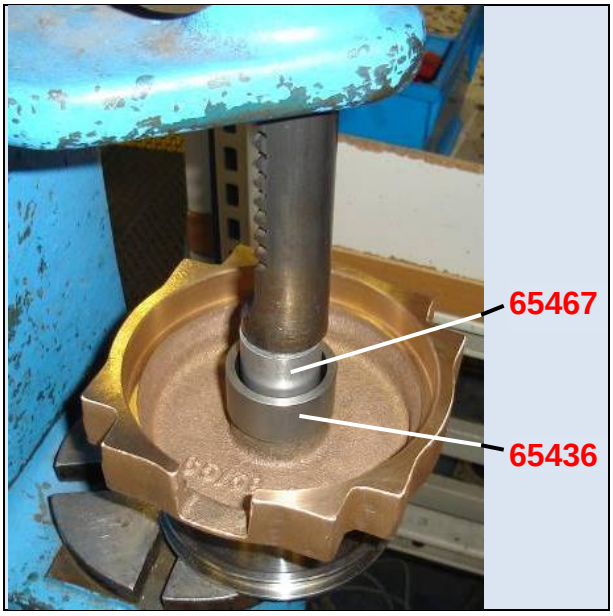
IDEX FIRE SUPPRESSION GROUP

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REPLACE THE PRIMER SEALS *continued*

14. Locate the Cylinder Support Tool (65466) between the piston (G) and the cylinder (M) to raise the cylinder.
15. Use a suitable manual press in conjunction with Drift Tool (65467) to push the 'O' ring/seal assembly (W,U,T) to the bottom of the cylinder (M). Do not fit the circlip (S) at this stage.
16. Locate the retaining disc (R) on top of the 'O' ring/seal assembly (W,U,T).
17. Locate the Circlip Fitting Tool (65436) over the end of the piston (G) shaft to rest on the cylinder (M).





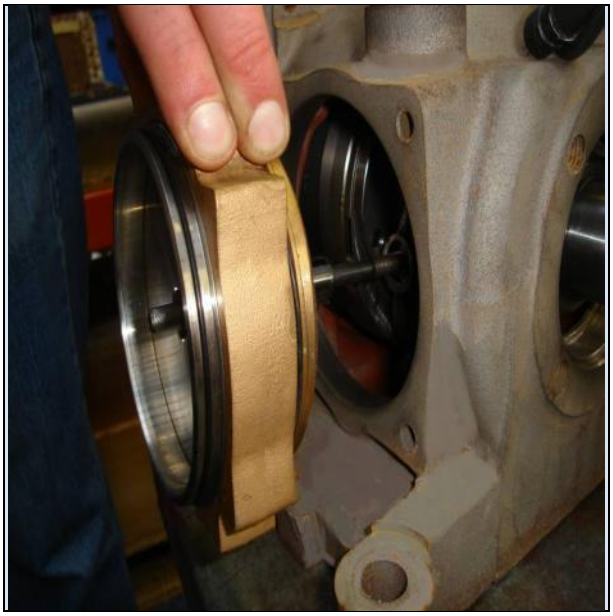
18. Insert the circlip (S) into the Circlip Fitting Tool (65436).
19. Locate the Circlip Drift Tool (65467) inside the Circlip Fitting Tool (65436) to rest on the circlip (S).
20. Using a suitable manual press, apply pressure to the Circlip Drift Tool (65467) so that the circlip (S) is pushed down until it locates the circlip groove in the cylinder.
21. If necessary, use the manual press to extract the piston from the cylinder/seal arrangement.
22. Remove the piston and re-assemble it to the cylinder in the correct orientation.
23. Install the complete assembly onto the bearing housing with the piston shaft placed to connect with the pump shaft yoke.

IDEX FIRE SUPPRESSION GROUP

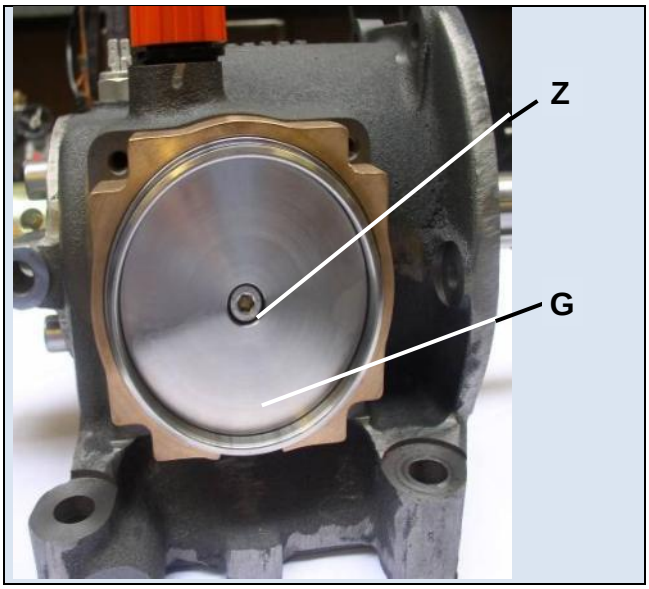
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REPLACE THE PRIMER SEALS continued





24. If only one cylinder assembly is removed for repair, the cylinder in place will maintain the position of the yoke. If both cylinders are removed, use a guide rod inserted into the yoke to help connect the yoke and the piston shaft. The cylinder/piston assembly will slide over the guide rod and connect with the yoke. Make sure the assembly is installed the correct way up as shown in the illustration below.



25. If re-using the screw, apply Loctite 243 to the screw threads. Install screw with a new bonded seal (Z) to secure the piston (G) to the yoke. Tighten to a torque of 20nM.
26. Install the priming valve cover (C) and secure with four screws (B) and washers.
27. Connect the hose (A) to the priming valve.

IDEX FIRE SUPPRESSION GROUP

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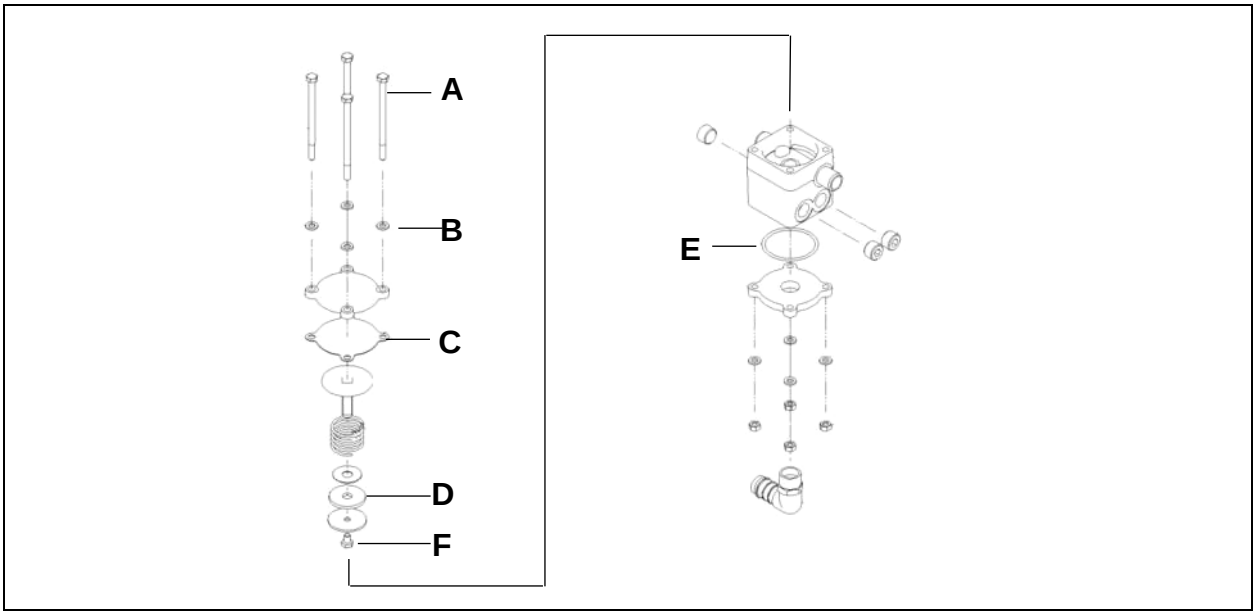
PREVENTIVE MAINTENANCE PROCEDURE
PM-017

FREQUENCY	**EVERY 24 MONTHS**	Back to Schedule
EQUIPMENT	**Pumps PC1_ / PC2_**	

REPLACE THE PRIMING VALVE SEALS AND DIAPHRAGM

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



Parts Required	Part No.	Qty	
(C) Diaphragm	56123	1	These parts are available in a service kit
(D) Seal	55669	1	
(E) 'O' Ring	53750	1	

1. Disconnect the priming pipes from the priming valve.
2. Remove the bolts (A)/nuts and washers (B). Remove the priming valve.
3. Remove the priming valve cover and discard the diaphragm (C).
4. Remove the screw (F) from the piston and separate the piston parts. Discard the seal (D). Discard the 'O' ring (E). Inspect parts for damage, replace as necessary.
5. Clean all parts are check that they are in good condition. Replace damaged parts.
6. Assemble parts in reverse order, making sure that a new 'O' ring (E), seal (D) and diaphragm (C) are installed.
7. Secure assembly with the bolts (A), washers B) and nuts.
8. Connect the priming pipes (A) to the priming valve.

IDEX FIRE SUPPRESSION GROUP

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PREVENTIVE MAINTENANCE PROCEDURE

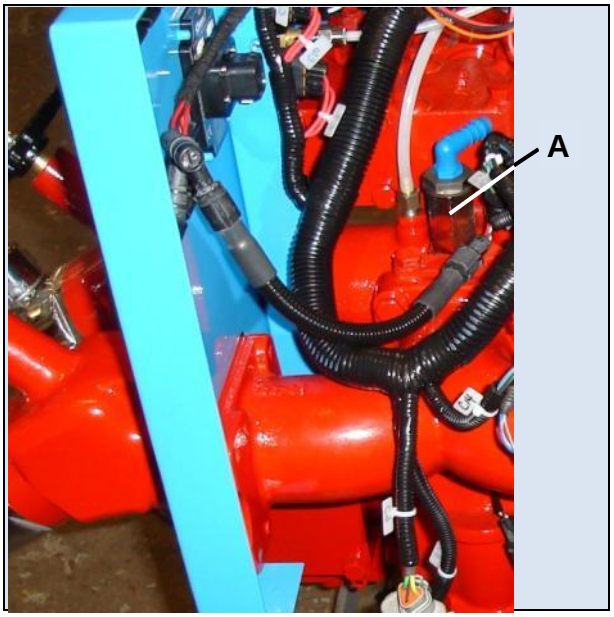
PM-018

FREQUENCY	**EVERY 24 MONTHS**	Back to Schedule
EQUIPMENT	**Pumps PC1_ / PC2_**	

THERMAL RELIEF VALVE TEST

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



A thermal relief valve (A) is fitted as standard to help prevent overheating. The thermal relief valve should open and discharge water when the pump temperature is either 42°C with the standard valve (blue elbow) or 74°C with the optional high temperature valve (grey elbow). A discharge pipe is connected to the valve elbow and routed away from the operator.

1. With the pump primed, close all discharge valves.
2. Select high pressure and run the pump at approximately 2800 rev/min to heat up the pump.
3. When the pump temperature reaches 42°C (standard) or 74°C (option) the thermal relief valve (A) should open and discharge water.

WARNING! AVOID CONTACT WITH HOT WATER DISCHARGE

4. Check for water emission from the valve discharge pipe.
5. Open a pump discharge valve to let cool water enter the pump. The flow from the thermal relief valve should stop, to confirm correct operation.

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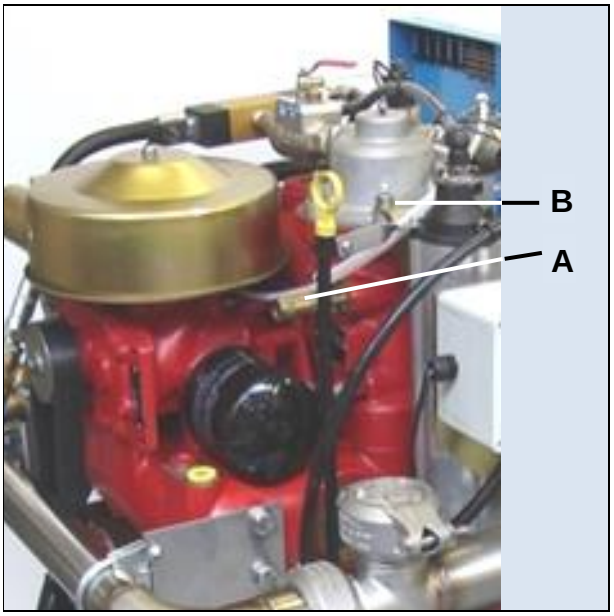
PREVENTIVE MAINTENANCE PROCEDURE
PM-019

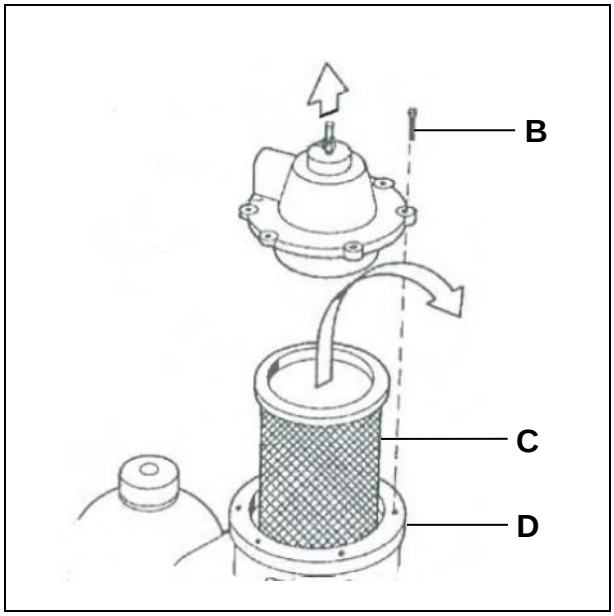
FREQUENCY	**EVERY 24 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Tempest 3**	

REPLACE THE COMPRESSOR OIL SEPARATOR ELEMENT

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(C) Separator	59271/02	1	

1. Open the safety valve (A) cap four to five turns to vent internal pressure. Fully close the safety valve cap.
2. Remove the screws (B) from the discharge valve. Note: The brackets that support the heat exchanger and the blowdown valve will be released when removing these screws.
3. Remove the discharge valve.

WARNING! BEFORE DISPOSING OF THE SEPARATOR, REFER TO THE GUIDELINES IN ENVIRONMENTAL PROTECTION.

4. Remove the oil separator (C) and dispose of carefully.

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5. Clean the inside of the separator housing (D). Clean the contact surfaces of the discharge valve and separator housing.
6. Lubricate the ‘O’ ring on the new oil separator (C) and install the oil separator in the separator housing.
7. Install the discharge valve on the separator housing. With the two support brackets in position, install the screws.
8. Tighten the screws alternately to equal tightness.

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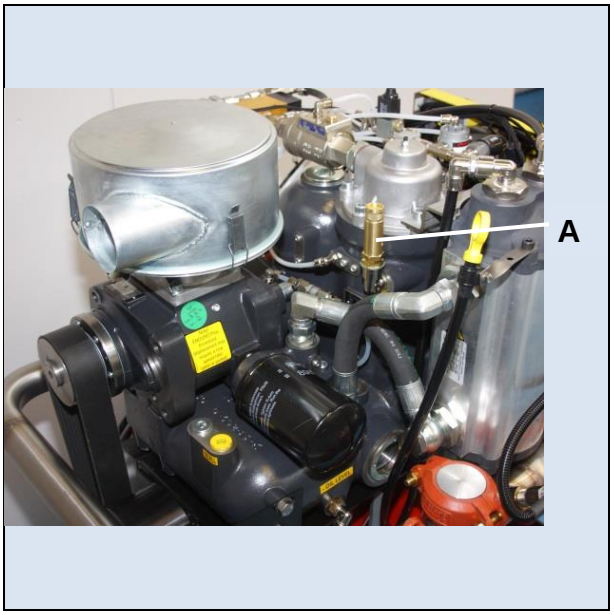
PREVENTIVE MAINTENANCE PROCEDURE
PM-019

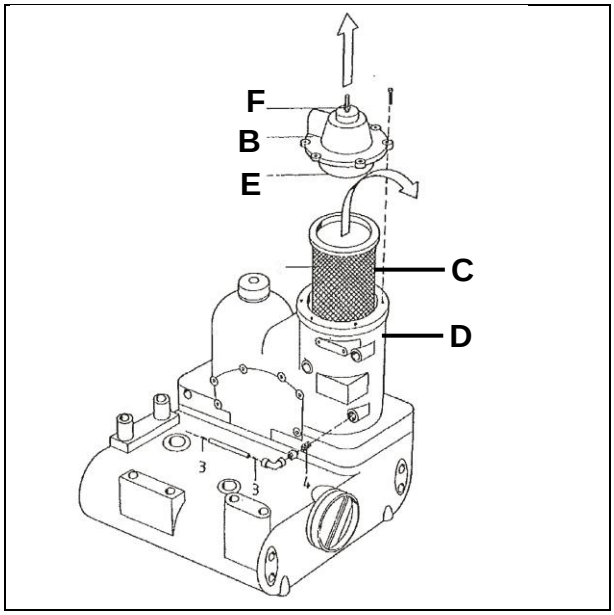
FREQUENCY	**EVERY 24 MONTHS**	Back to Schedule
EQUIPMENT	**Compressor – Tempest 6**	

REPLACE THE COMPRESSOR OIL SEPARATOR ELEMENT

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(C) Separator	TAM-03498328	1	

4. Open the safety valve (A) cap four to five turns to vent internal pressure. Fully close the safety valve cap.
5. Remove the discharge valve (B) from the compressor. Note: The brackets that support the heat exchanger and the blowdown valve will be released when removing these screws.

WARNING! BEFORE DISPOSING OF THE SEPARATOR, REFER TO THE GUIDELINES IN ENVIRONMENTAL PROTECTION.

6. Remove the oil separator (C) and dispose of carefully.
7. Clean the inside of the separator housing (D). Clean the contact surfaces of the discharge valve and separator housing.

IDEX FIRE SUPPRESSION GROUP

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8. Lubricate the ‘O’ ring on the new oil separator (C) and install the oil separator in the separator housing.
9. Replace the ‘O’ ring (E) between the new oil separator and the discharge valve.
10. Replace the seals of the discharge valve. When assembling the valve, leave the M6 nut (F) about 2mm off the valve cover
11. Install the discharge valve on the separator housing. With the two support brackets in position, install the screws.
12. Tighten the screws alternately to equal tightness.

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PREVENTIVE MAINTENANCE PROCEDURE
PM-019

FREQUENCY	**EVERY 24 MONTHS**	**Back to Schedule**
EQUIPMENT	**Compressor – Enduro 12**	

COMPRESSOR OIL SEPARATOR ELEMENT

There is no need to service the element in the oil separator used with the Enduro 12 compressor. If the unit proves to be malfunctioning, then the entire oil separator should be replaced. Consult with Godiva Ltd. for further instructions.

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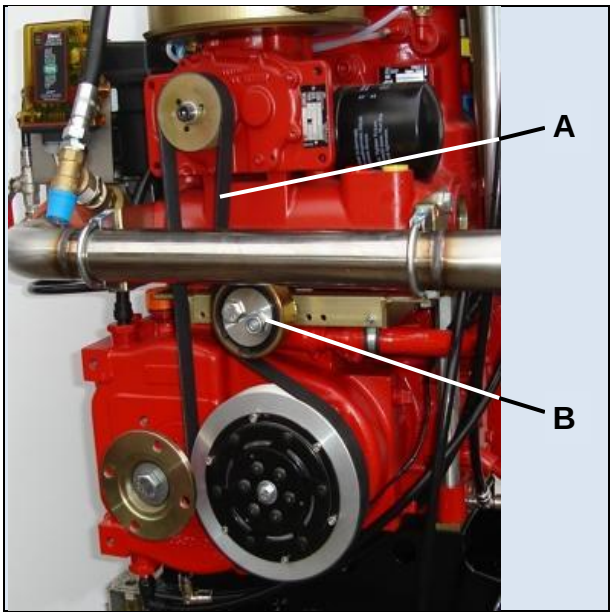
PREVENTIVE MAINTENANCE PROCEDURE
PM-020

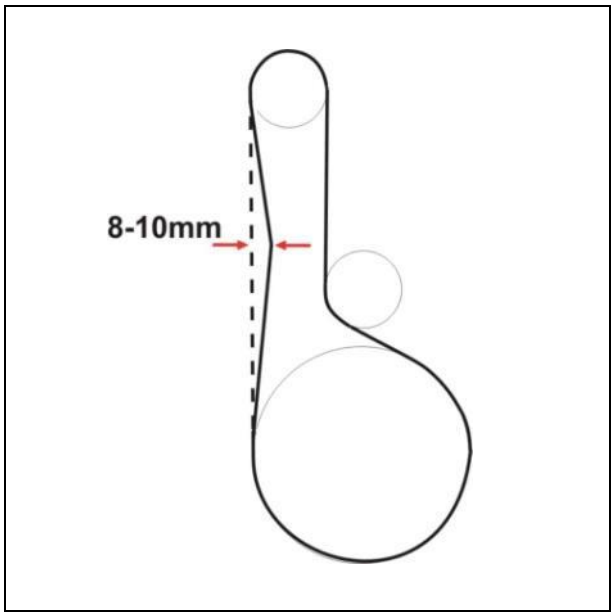
REQUENCY	**EVERY 5 YEARS**	**Back to Schedule**
EQUIPMENT	**Compressor – Tempest 3**	

REPLACE THE COMPRESSOR DRIVE BELT – Tempest 3

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(A) Drive Belt	60578/01	1	
(B) Tensioner	60579	1	

1. Loosen the tensioner screw (B) and rotate the tensioner so that the belt (A) is loose on the pulleys.
2. Remove and discard the belt.
3. Install a new *Polydrive* 12PJ ribbed belt. Make sure that the belt aligns uniformly on the pulleys. Turn the belt at least two revolutions in the correct direction. Check that belt is running squarely on both pulleys. If belt does not run squarely, the compressor must be re-aligned.
4. Adjust belt tension as instructed in procedure PM-005 in Section 6, Preventive Maintenance.

IDEX FIRE SUPPRESSION GROUP

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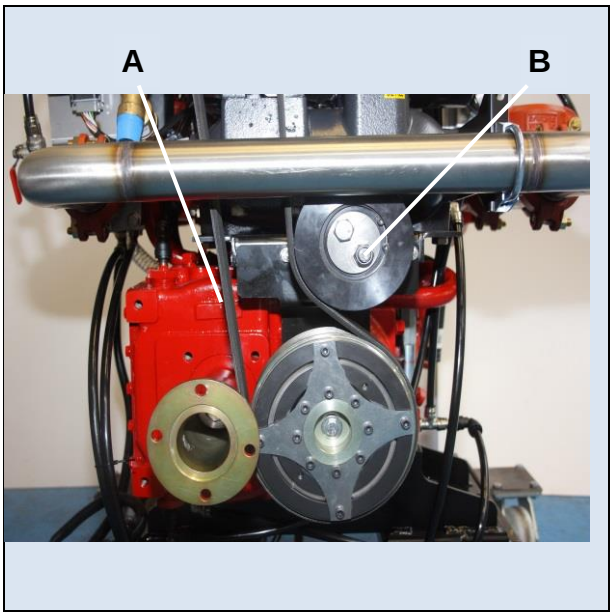
PREVENTIVE MAINTENANCE PROCEDURE
PM-020

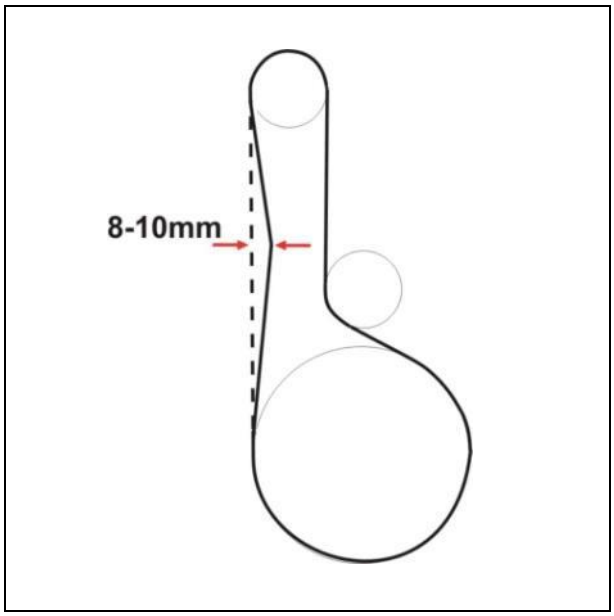
REQUENCY	**EVERY 5 YEARS**	**Back to Schedule**
EQUIPMENT	**Compressor – Tempest 6**	

REPLACE THE COMPRESSOR DRIVE BELT – Tempest 6

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(A) Drive Belt	60578/03	1	
(B) Tensioner	65447	1	

5. Loosen the tensioner screw (B) and rotate the tensioner so that the belt (A) is loose on the pulleys.
6. Remove and discard the belt.
7. Install a new *Polydrive* 12PJ ribbed belt. Make sure that the belt aligns uniformly on the pulleys. Turn the belt at least two revolutions in the correct direction. Check that belt is running squarely on both pulleys. If belt does not run squarely, the compressor must be re-aligned.
8. Adjust belt tension as instructed in procedure PM-005 in Section 6, Preventive Maintenance.

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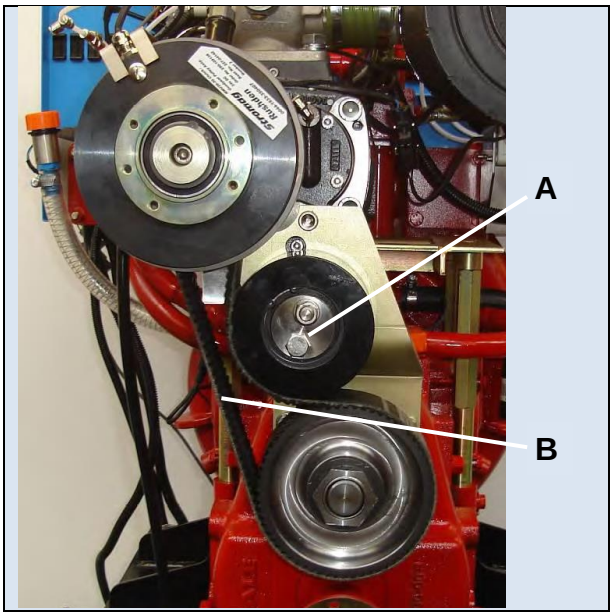
PREVENTIVE MAINTENANCE PROCEDURE
PM-020

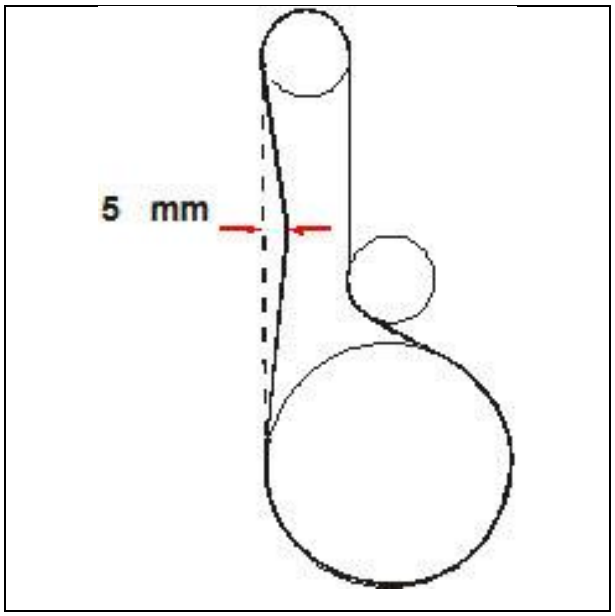
REQUENCY	**EVERY 5 YEARS**	**Back to Schedule**
EQUIPMENT	**Compressor – Enduro 12**	

REPLACE THE COMPRESSOR DRIVE BELT – Enduro 12

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





Parts Required	Part No.	Qty	These parts are available in a service kit
(A) Tensioner	61198/002	1	
(B) Drive belt	61291	1	

9. Loosen the tensioner screw (A) and rotate the tensioner so that the belt (B is loose on the pulleys.
10. Remove and discard the belt.
11. Install a new Goodyear Eagle PD synchronous drive belt. Make sure that the belt aligns uniformly on the pulleys. Turn the belt at least two revolutions in the correct direction. Check that belt is running squarely on both pulleys. If belt does not run squarely, the compressor must be re-aligned.
12. Adjust belt tension as instructed in procedure PM-005 in Section 6, Preventive Maintenance.

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7. TROUBLESHOOTING

INTRODUCTION

The first step in troubleshooting is to determine which part of the system caused the malfunction.

Operate the pump and FoamLogix system in accordance with standard operating procedures and isolate where the problem occurs.

If the system malfunctions make sure ALL the following conditions are checked:

- ✓ All hose connections are correctly installed and tight.
- ✓ All electrical connections are correctly installed and tight.
- ✓ Equipment electrical system is energised, with power available to the pump panel and FoamLogix system.

When the above conditions are met, go to the system fault finding charts to determine the cause of the problem. Remedial actions are identified on the charts with the appropriate Preventive or Corrective procedure. If using this manual on a computer, these procedures may be accessed direct from the flow chart by doing a left click on the button provided.

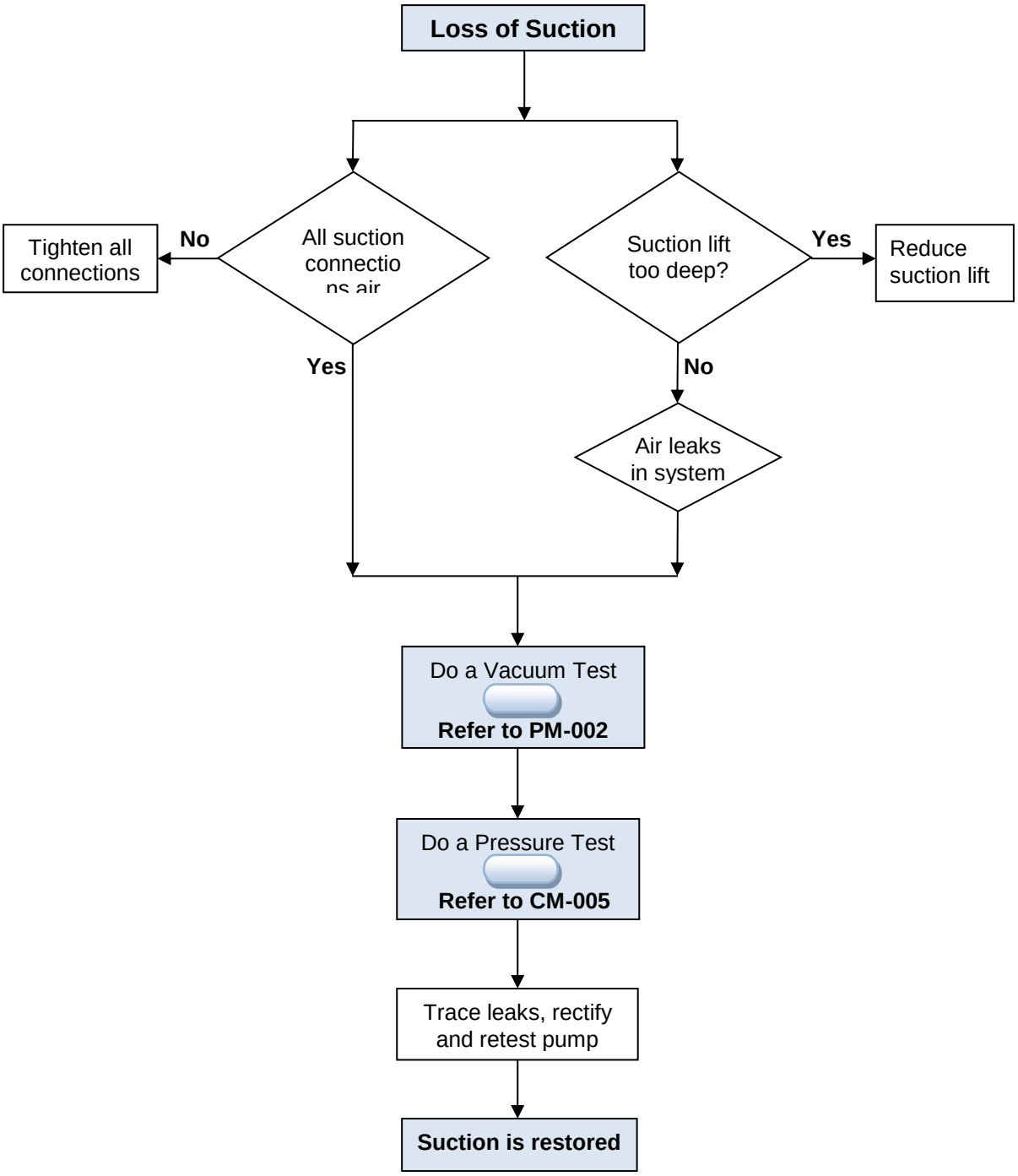
Additional assistance with fault diagnosis is also provided in the diagrams that follow.

- Plumbing Schematic
- Circuit Schematic
- Wiring Diagram
- Clutch Wiring Schematic

Detailed troubleshooting and remedial information for individual subsystems is provided in the applicable manufacturer's manuals in Section 11, Appendix.

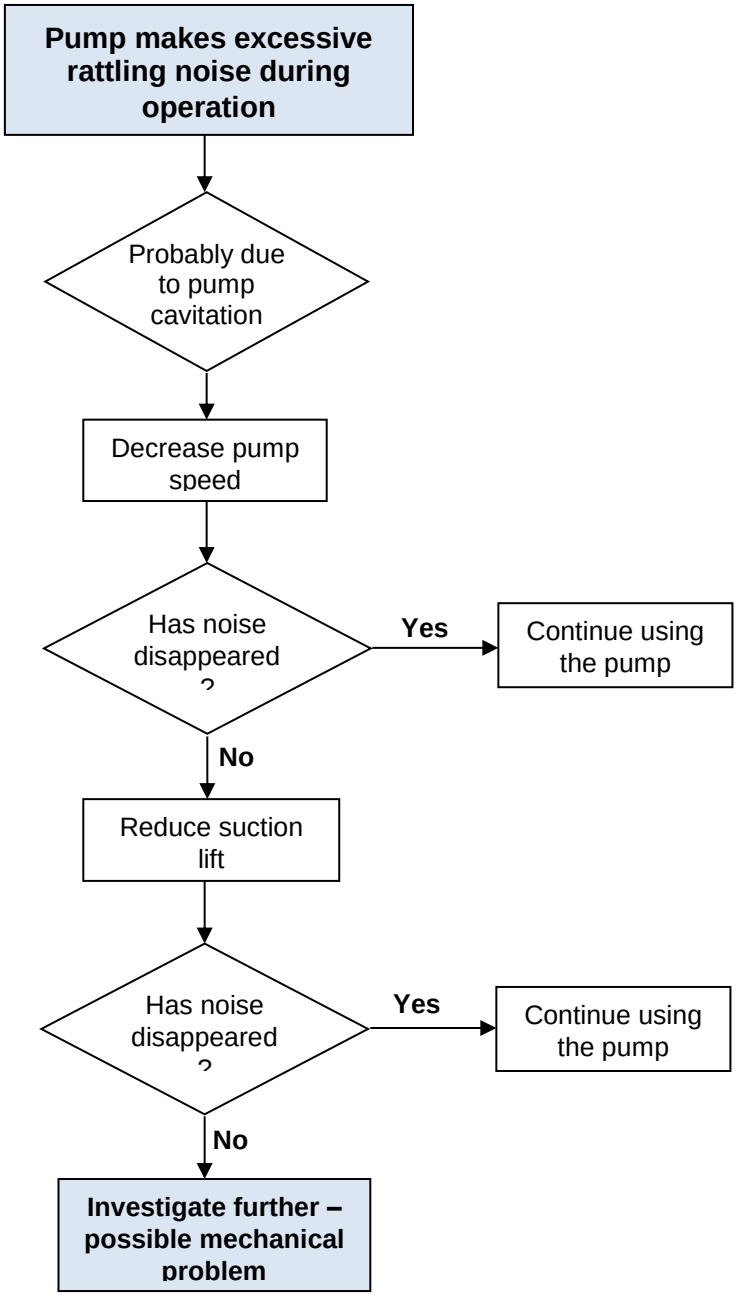
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PUMP OPERATING FAULTS 1 – LOSS OF SUCTION



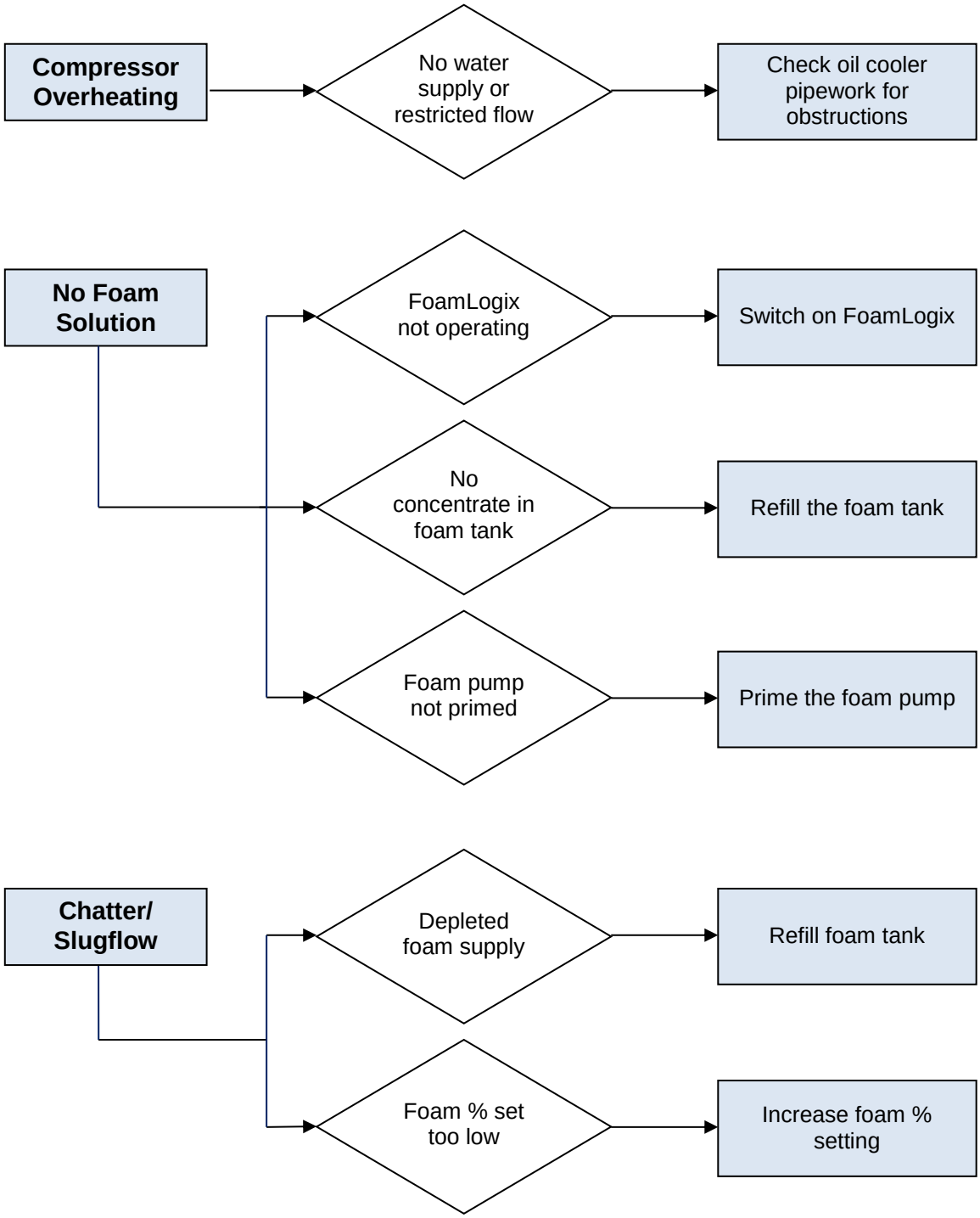
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PUMP OPERATING FAULTS 2 – EXCESSIVE PUMP NOISE



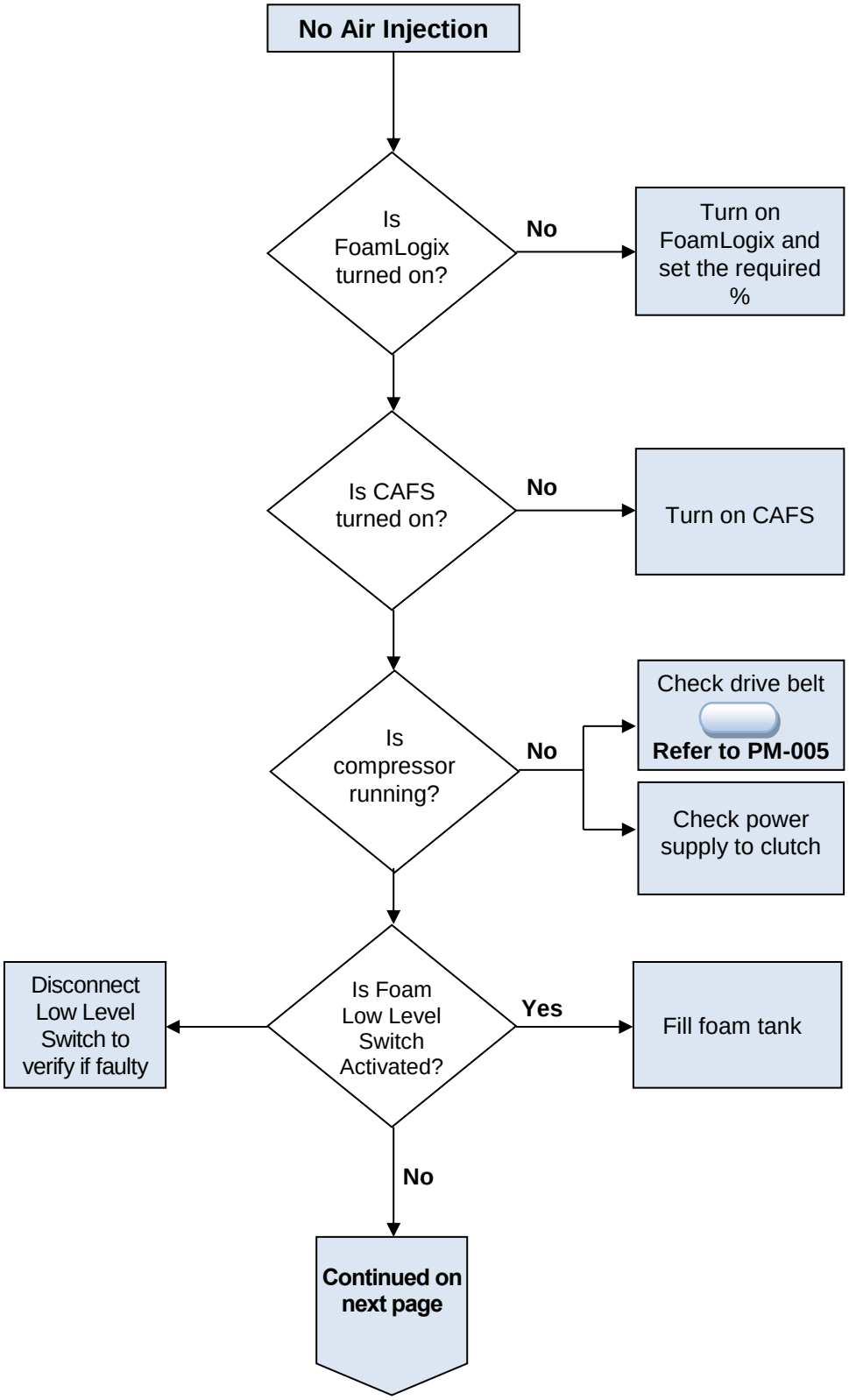
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GENERAL OPERATING FAULTS - CAFS



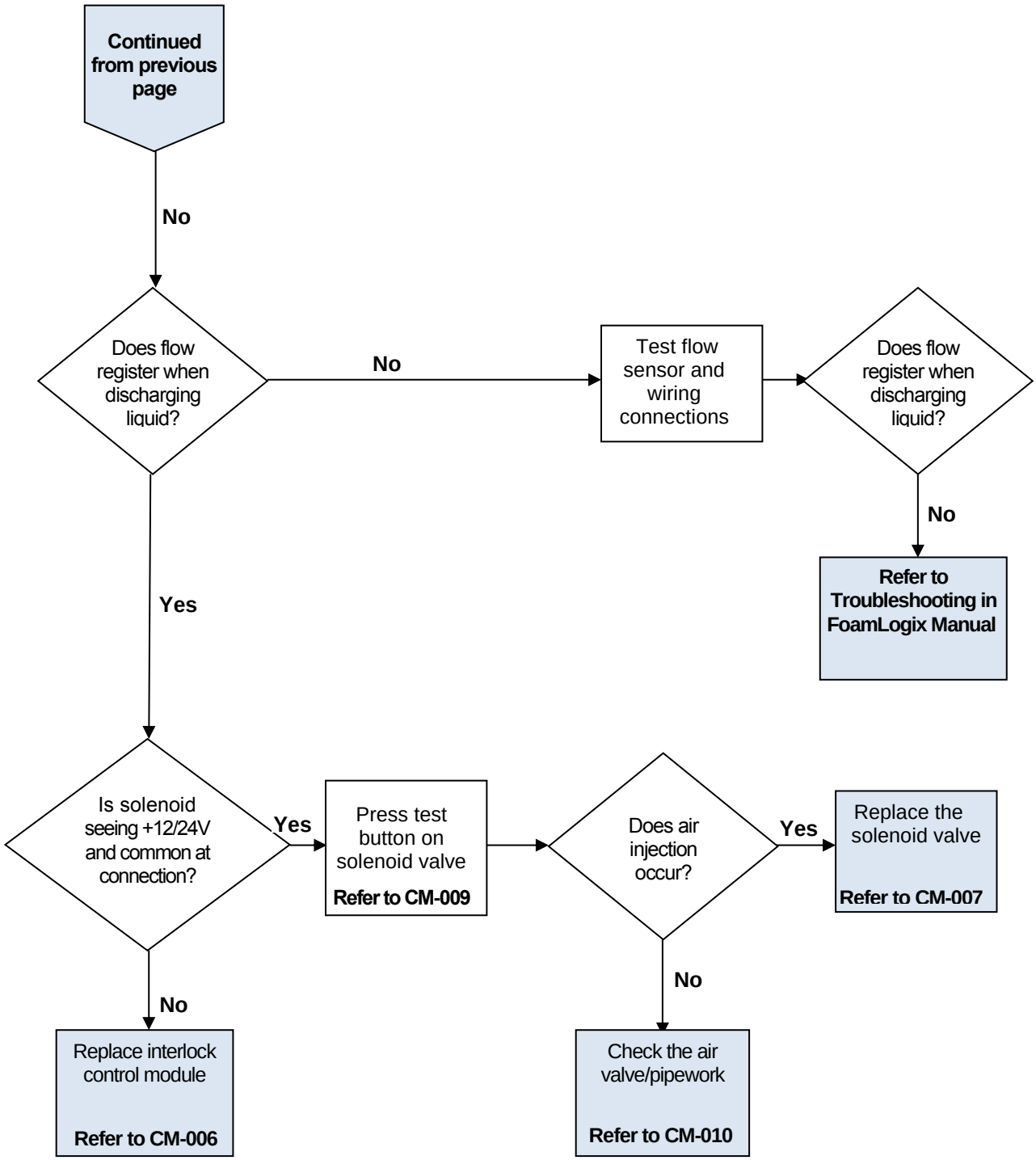
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AIR INJECTION FAULTS



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AIR INJECTION FAULTS continued



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8. CORRECTIVE MAINTENANCE

INTRODUCTION

WARNING! BEFORE WORKING ON THE EQUIPMENT, THE SECTION ON SAFETY MUST BE CAREFULLY READ, UNDERSTOOD AND STRICTLY ADHERED TO.

WARNING! FAILURE TO COMPLY WITH THE CORRECTIVE MAINTENANCE AND RELATED PROCEDURES IN THIS MANUAL MAY RESULT IN SERIOUS PERSONAL INJURY AND/OR DAMAGE TO THE EQUIPMENT.

It is essential that this Godiva equipment is maintained only by trained personnel.

When contacting Godiva Ltd, always quote the six figure serial number that is stamped on a machined boss on the pump volute body.

The terms ‘Left Hand’ (LH) and ‘Right Hand’ (RH) apply when the pump unit is viewed from the suction tube end. For the purposes of this document, this is regarded as the front of the assembly.

For some corrective maintenance operations on ancillary equipment, actual procedures are not included in this manual. In this case, clear directions are given to the applicable ancillary equipment manufacturer’s documentation that is provided separately.

For additional maintenance guidance, refer to the Schematic and Circuit Drawings in Section 10, Diagrams.

Maintenance operations not covered by this manual must be done by trained, qualified service personnel authorised by Godiva Ltd or its representative.

EQUIPMENT	PROCEDURE
Prima Fire Pump	CM-001
FoamLogix System	CM-002
Intelli-Tank System	CM-003
Gardner Denver Compressor 3, 6, 12 Models	CM-004
Prima Gearbox	CM-005
Thermal Relief Valve	CM-006
Pressure Test	CM-007
Interlock Control Module	CM-008
Solenoid Valve	CM-009
Air Valve and Solenoid Valve	CM-010
FoamLogix Foam Pump	CM-011

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Manifold	CM-012
Manifold	CM-013
Manifold	CM-014
Manifold	CM-015
Pressure Switches - Compressor	CM-016
Electrics	CM-017

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CORRECTIVE MAINTENANCE PROCEDURE
CM-001

EQUIPMENT	**Pumps PC1_ / PC2_**

PRIMA FIRE PUMP



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

For corrective maintenance operations on the Prima Fire Pump including component removal and installation, actual procedures are not included within this manual.

Refer to the Godiva Ltd Prima Workshop Manual GP/257 in Section 11, Appendix.

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CORRECTIVE MAINTENANCE PROCEDURE
CM-002

EQUIPMENT	**FoamLogixSystem and SmartCAFS**

FOAMLOGIX SYSTEM AND SMARTCAFS COMPONENTS



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

Corrective Maintenance Procedures relating to the FoamLogix system and associated components are detailed in the individual manufacturer's documents listed below and provided in Section 11, Appendix.

- FoamLogix Installation and Operation Manual
- Foam Pump Feedback Sensor Instructions
- Paddlewheel Flow Sensor Instructions
- SmartCAFS SPS Panel
- Smart CAFS Manifold
- SmartCAFS Actuator

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CORRECTIVE MAINTENANCE PROCEDURE
CM-003

EQUIPMENT	**Intelli-Tank System**

INTELLI-TANK



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

Procedures and calibration instructions relating to the Intelli-Tank system and associated components are detailed in the Class 1 Intelli-Tank Operations Manual in Section 11, Appendix.

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CORRECTIVE MAINTENANCE PROCEDURE

CM-004

EQUIPMENT	**Pumps PC1_ / PC2_**

GARDNER DENVER TEMPEST 3 COMPRESSOR



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

For corrective maintenance operations on the Gardner Denver Tempest 3 Compressor, including component removal and installation, actual procedures are not included within this manual.

Refer to the Gardner Denver Tempest 3 Manual (including Spare Parts) in Section 11, Appendix.

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CORRECTIVE MAINTENANCE PROCEDURE

CM-004

EQUIPMENT	**Pumps PC1_ / PC2_**

GARDNER DENVER TEMPEST 6 COMPRESSOR



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

For corrective maintenance operations on the Gardner Denver Tempest 6 Compressor, including component removal and installation, actual procedures are not included within this manual.

Refer to the Gardner Denver Tempest 6 Manual (including Spare Parts) in Section 11, Appendix.

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CORRECTIVE MAINTENANCE PROCEDURE

CM-004

EQUIPMENT	**Pumps PC1_ / PC2_**

GARDNER DENVER ENDURO 12 COMPRESSOR



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

For corrective maintenance operations on the Gardner Denver Tempest 3 Compressor, including component removal and installation, actual procedures are not included within this manual.

Refer to the Gardner Denver Enduro 12 Manual (including Spare Parts) in Section 11, Appendix.

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CORRECTIVE MAINTENANCE PROCEDURE
CM-005

EQUIPMENT	**Pumps PC1_ / PC2_**

PRIMA GEARBOX



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

Maintenance operations on the Prima gearbox are limited to the oil level check PM-001 and oil change procedure PM-011 in Preventive Maintenance, Section 6.

The gearbox cooling system requires no regular maintenance. If the system needs to be drained for any reason, proceed as follows.

1. At the front of the pump, remove the gearbox water drain plug.
2. Drain the water into a suitable container ready for disposal.
3. Discard the drain plug seal.
4. Install the drain plug complete with a new seal.

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CORRECTIVE MAINTENANCE PROCEDURE
CM-006

EQUIPMENT	**Pumps PC1_ / PC2_**

THERMAL RELIEF VALVE MAINTENANCE



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

Corrective maintenance procedures on this component are described in the Thermal Relief Valve Maintenance Instructions GP/265 in Section 11, Appendix.

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CORRECTIVE MAINTENANCE PROCEDURE
CM-007

EQUIPMENT	**Pumps PC1_ / PC2_**

PRESSURE TEST

Do this test if a leak is indicated in the vacuum test as specified in Preventative Maintenance Procedure PM-002. This test is intended to trace the leak(s) that cause the loss of vacuum.



WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.



WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.

1. Do this test with the pump stopped.
2. A clean, pressurised (3.5 - 7.0 bar) water supply is required for this procedure.
3. Close the discharge valves.
4. Connect the water supply to the pump suction.
5. Allow air to escape from the pump, by partially opening a discharge valve and applying water pressure.
6. With the pump full of water, close the discharge valve and build up the pressure to 3.5 - 7.0 bar.
7. Evidence of leaks will be shown by water loss at the leakage points.
8. Rectify the leak.
9. If no leaks are visible, the source of leakage must be between the priming valve and the primer. Examine the items that follow.

   a) The inlet seal in the primer end cap.
   (Refer to Preventive Maintenance Procedure PM-016).

   b) The priming valve diaphragm.
   (Refer to Preventive Maintenance Procedure PM-017).

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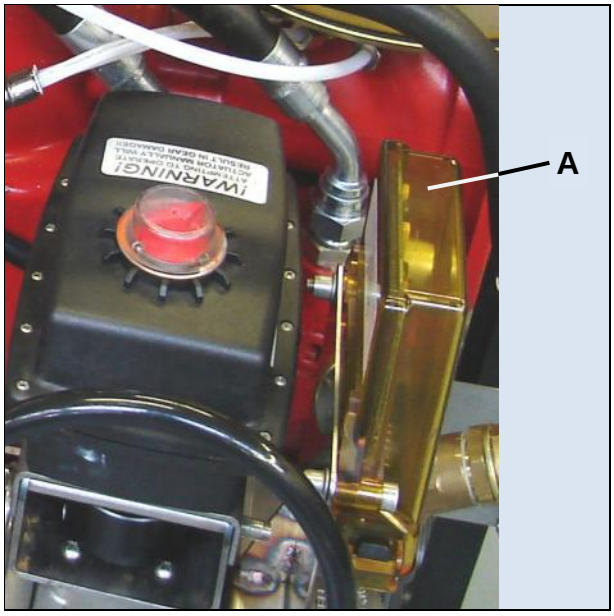
CORRECTIVE MAINTENANCE PROCEDURE
CM-008

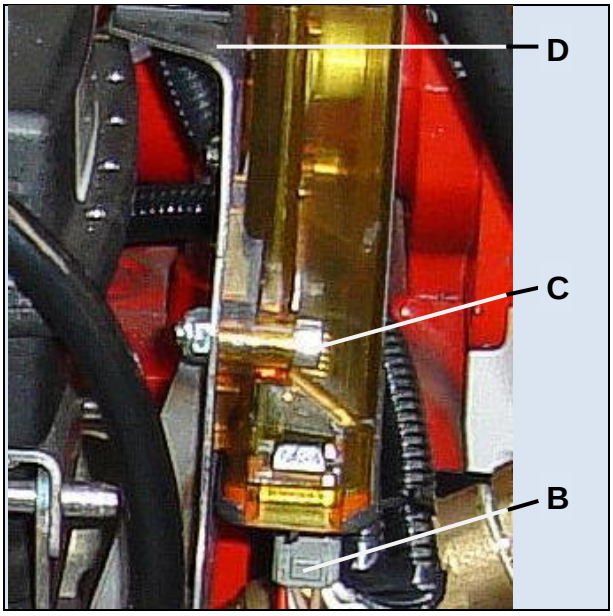
EQUIPMENT	**SmartCAFS System**

THE INTERLOCK CONTROL MODULE

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





1. Identify the interlock control module (A).
   Note: the location of the interlock control module on the CAFS50 and 100 is located near the manifold and compressor, on the CAFS200 where the manifold is mounted separately the interlock control module is located on top of the pump.

2. Disconnect the wiring harness (B) from the interlock control module.
3. Remove the two screws (C) and washers that attach the interlock control module to the mounting bracket (D).
4. Install the new interlock control module.

Refer also to the Interlock Module Instructions in Section 11, Appendix.

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INTERLOCK FOR COMPRESSOR CLUTCH CONTROL

Models built from mid-2013 are fitted with a solid state device complete with pressure switch indicating LEDs and compressor hours run meter. This unit is primarily of interest to service technicians for CAFS fault diagnosis. The device is located on the left side of the pump.

LEDs for water pressure switch and air pressure switch – will be alight when circuit is closed (no pressure).



LED – replicates the Air Enabled Indicator on the main panel (see page 14, item 11)

Compressor hours run

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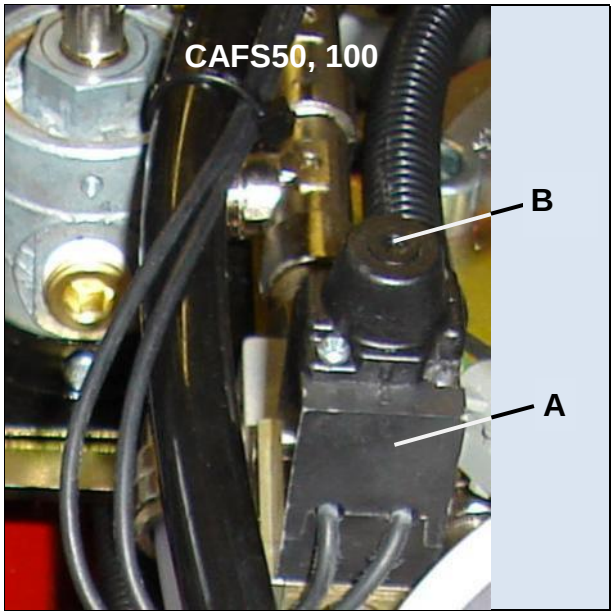
CORRECTIVE MAINTENANCE PROCEDURE
CM-009

EQUIPMENT	**SmartCAFS50 System**

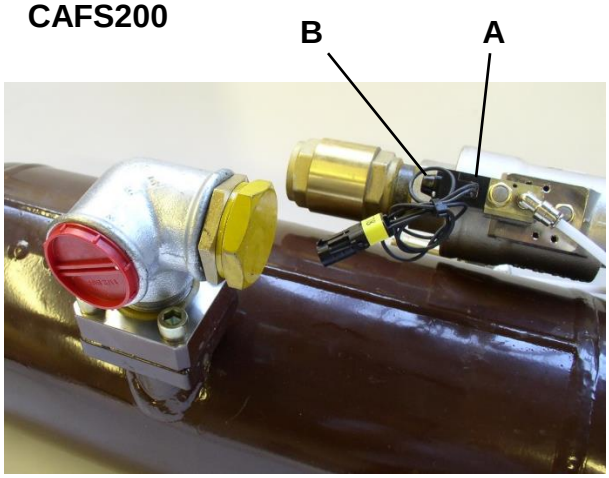
THE AIR INJECT SOLENOID VALVE

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



CAFS200



1. Identify the solenoid valve (A).
   Note: the location of the solenoid valve on CAFS50 and 100 is on the compressor, on the CAFS200 it is located on the separator tank.

2. If the appropriate voltage (12V or 24V) and common is verified at the electrical connection, press the test button (B) and check if air injection occurs.
3. If air injection does not occur, check the air valve and pipework.
4. If air injection does occur, the solenoid valve is faulty and must be replaced. Refer to the Prima SmartCAFS Parts Manual in Section 9.

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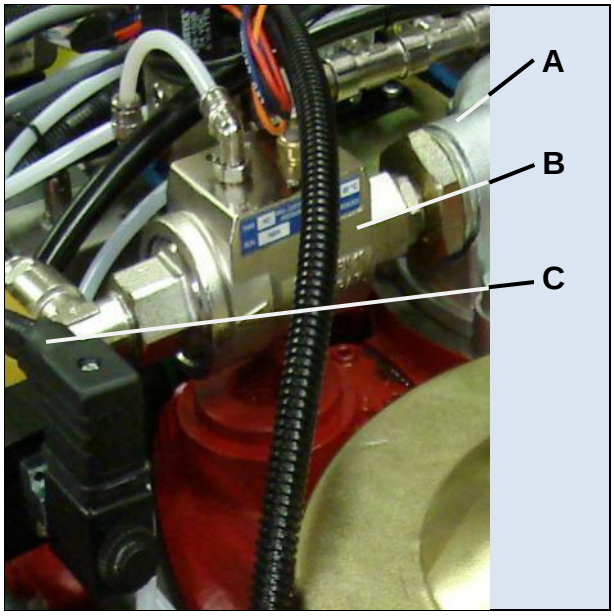
CORRECTIVE MAINTENANCE PROCEDURE
CM-010

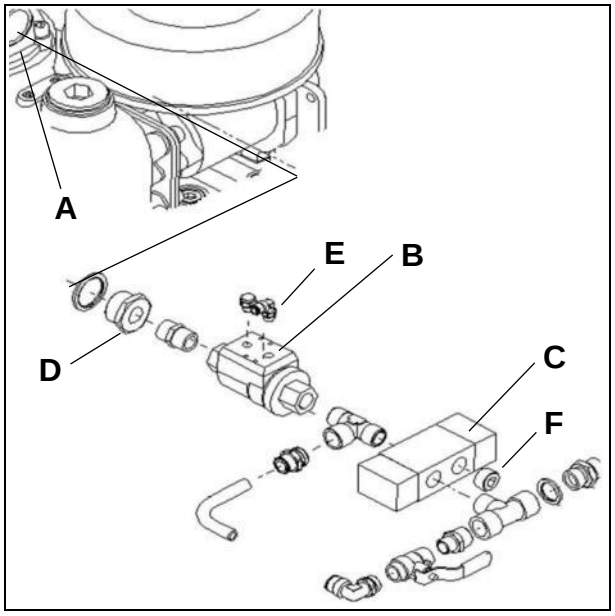
EQUIPMENT	**Compressor – CAFS50, CAFS100**

AIR VALVE AND SOLENOID VALVE

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





1. Identify the compressor discharge (A), the air valve (B) and solenoid valve (C).
   Note: the location of the air valve and solenoid valve for the CAFS50 and 100 is on the compressor
   The CAFS200 does not use the solenoid valve (C) as high pressure hose reels are not used on this type of system.

2. If removed, make sure that a new bonded seal is used on the reducing bush (D) that is installed in the compressor discharge.
3. The threads of metal pipe fittings and connectors must be coated with Loctite 542 before re-assembly. Make sure that no Loctite enters the air valve or solenoid.
4. Make sure that a silencer (E) is installed on the air valve before re-assembly.
5. Before re-assembly, make sure that a hexagon plug (F) is installed into the outlet port of the solenoid valve nearest the coil. Seal the threads with Loctite 542.

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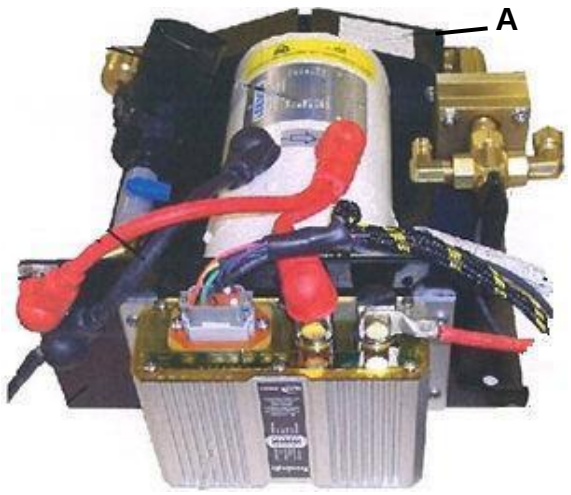
CORRECTIVE MAINTENANCE PROCEDURE
CM-011

EQUIPMENT	**FoamLogix System**

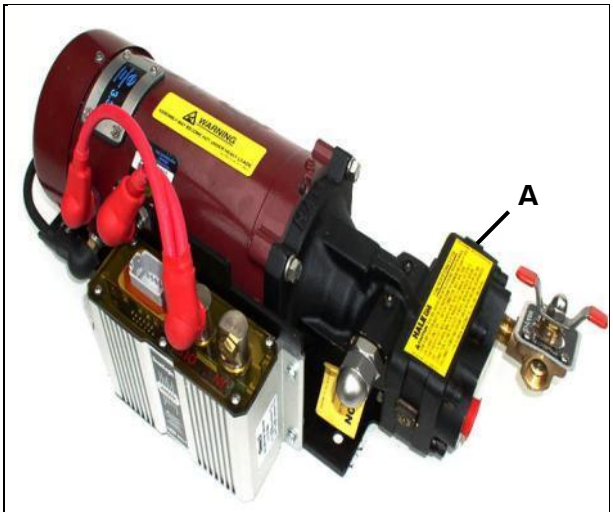
FOAMLOGIX FOAM PUMP

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



FoamLogix 2.1 A



FoamLogix 3.3, 5.0, 6.5

Identify the foam pump (A) on the type of FoamLogix system installed in the equipment and rectify any obvious blockage.

If it is necessary to dismantle the pump, refer to the separate Foam Pump instructions. These are detailed within the document, Foam Pump Feedback Sensor Instructions in Section 11, Appendix.

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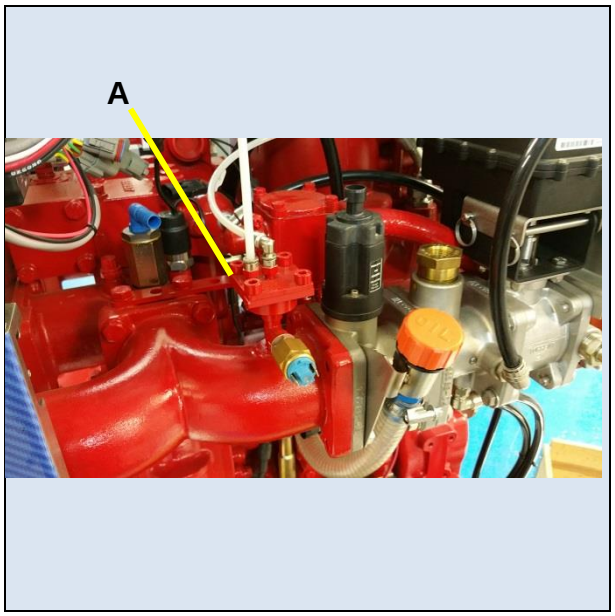
CORRECTIVE MAINTENANCE PROCEDURE
CM-012

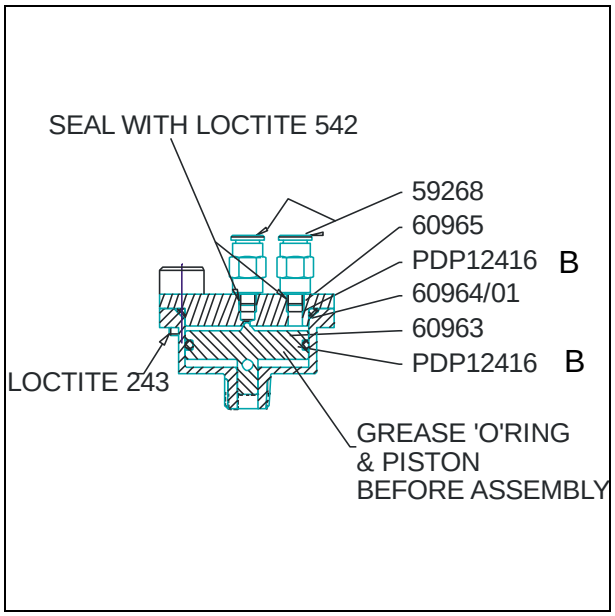
EQUIPMENT	**Manifold**

PRESSURE BALANCE VALVE

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





1. The system will automatically provide the correct amount of air for the quantity of water/foam solution passing through the manifold.

2. The pressure balance valve (A) ensures air and water is flowing at equal pressures.

3. The valve may fail to operate if debris becomes lodged in the mechanism, or the O rings wear and fail to provide a seal.

4. Remove the valve from the manifold to access the internal parts. The tubing attached to the top are push-in fixings, note which tube is connected to which connector.

5. Remove the piston from the housing, clean the inside of the housing. Replace the O rings (B) if necessary

6. Grease the O ring on the piston before replacing into the housing and sealing with the top. Replace the tubing connections to the adaptors on the top.

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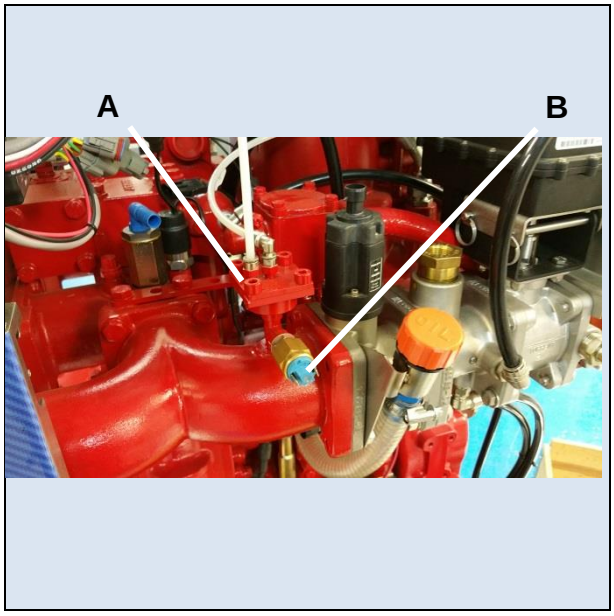
CORRECTIVE MAINTENANCE PROCEDURE
CM-013

EQUIPMENT	**Manifold**

PRESSURE BALANCE VALVE – PRESSURE SWITCH

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





1. The system will automatically provide the correct amount of air for the quantity of water/foam solution passing through the manifold.

2. The pressure balance valve (A) ensures air and water is flowing at equal pressures.

3. The pressure switch (B) ensures that the compressor does not engage above 2400rpm – subjecting the clutch mechanism to strain. It keeps the compressor disengaged until pump speed has reduced to a suitable level.

4. Pull back the protective sheath and check that the pressure switch connections are secure.

5. Conduct a continuity test across the two terminals to make sure the switch is functioning (with no pressure in pump). If the test is positive, run the pump up to 7 bar, the switch will open.

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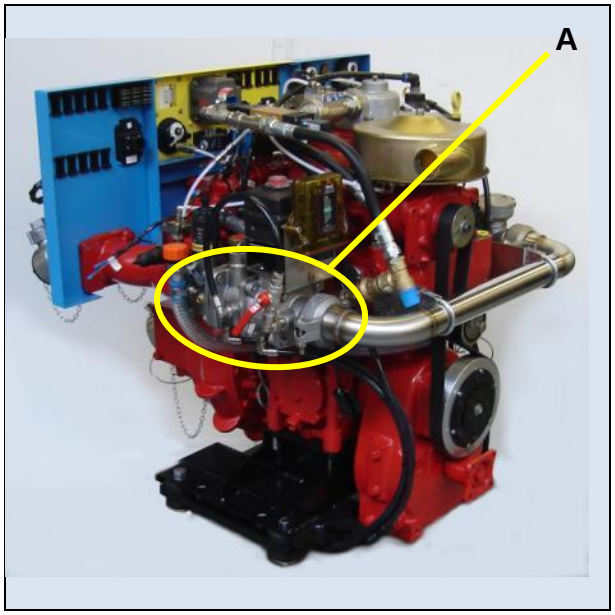
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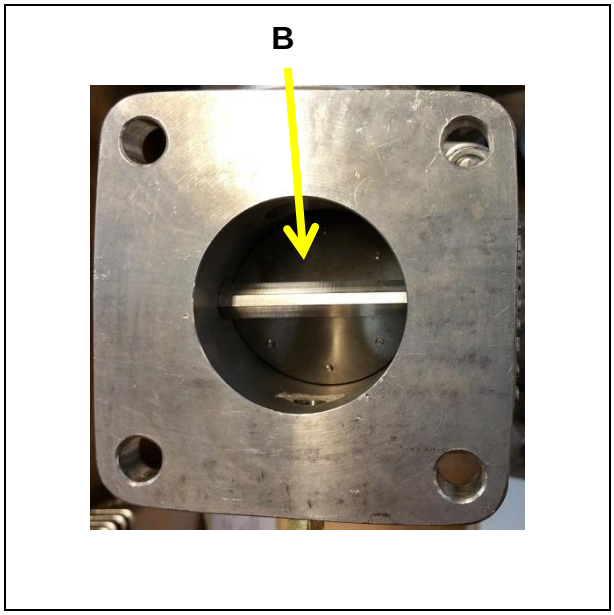
EQUIPMENT	**Manifold**

MANIFOLD NON-RETURN VALVES

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





1. The mixing manifold (A) contains two non-return valves. These prevent foam from passing back to the main pump, and possibly vehicle tank.

2. If foam is detected in the main pump or vehicle tank, then the non-return valves are to be suspected of failing to close.

3. Disconnect and remove the manifold from the pump to visually inspect the non-return valves (B).
Note: on CAFS200 – the manifold is mounted separately from the pump.

4. It is recommended that the non-return valves are replaced by a Godiva service Technician or the manifold returned to Godiva for re-fitting.

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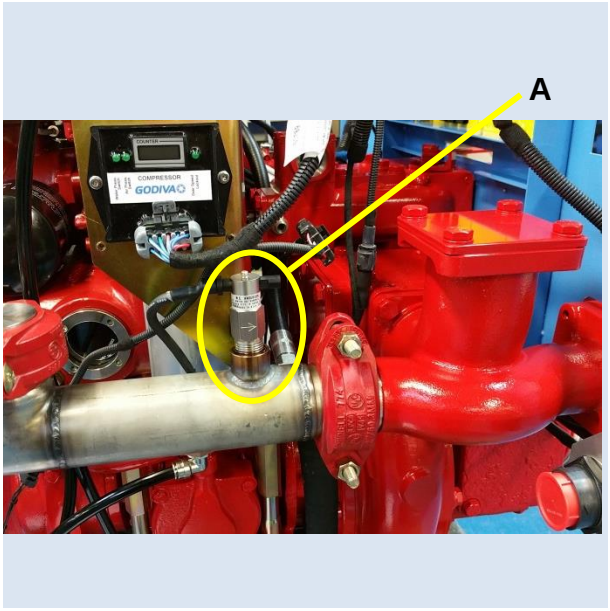
CORRECTIVE MAINTENANCE PROCEDURE
CM-015

EQUIPMENT	**Manifold – CAFS50, CAFS100**

FLOW SWITCH

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



1. The discharge manifold is fitted with a flow switch (A) that senses if compressed air foam solution is being discharged through the hose reel or lay flat hose discharge.

2. If discharging through hose reel, less air is needed, so an air restriction solenoid is activated.

3. Check that the flow switch is functioning by conducting a continuity test on the switch.

4. Note: on CAFS200 this flow switch is not required as high pressure hose reels are not used on this type of system.

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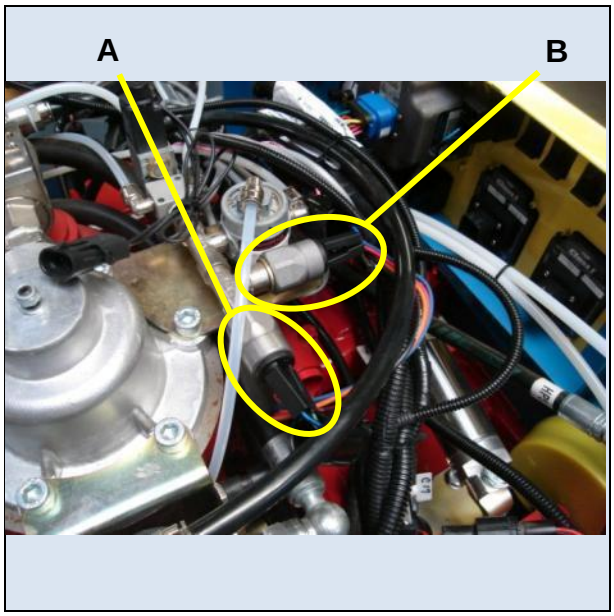
CORRECTIVE MAINTENANCE PROCEDURE
CM-016

EQUIPMENT	**Pressure Switches – Compressor CAFS50, 100**

PRESSURE SWITCH A AND B – CAFS50, CAFS100

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





1. Pressure swtich (A in photograph) is closed. In operation at 1 bar pressure it will open until compressor pressure reduces.

2. Check that all the connections are secure. Conduct a continuity test across the two terminals to make sure the sensor is functioning.

3. Pressure sensor (B in photograph) is open. In normal operation at 1 bar pressure it will close. It is acting as a safety interlock device, if no air is sensed, the air ratio control valve in the manifold is set to fully wet. Only a water/foam mixture will discharge from the manifold.

4. Check that all the connections are secure. Conduct a continuity test across the two terminals to make sure the switch is functioning.

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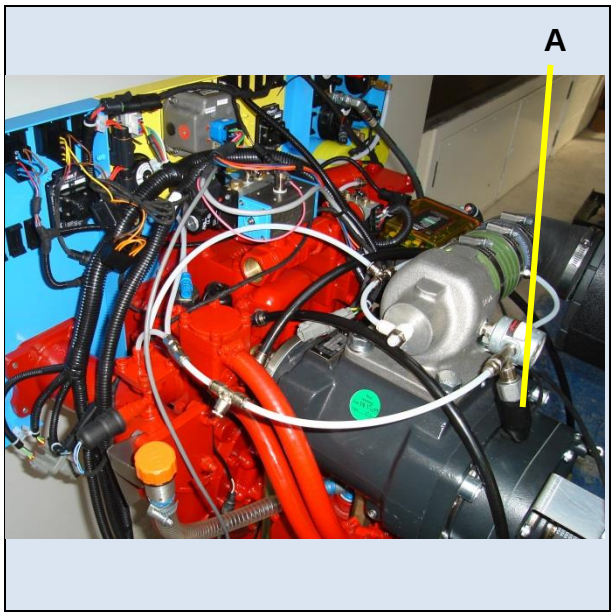
CORRECTIVE MAINTENANCE PROCEDURE
CM-016

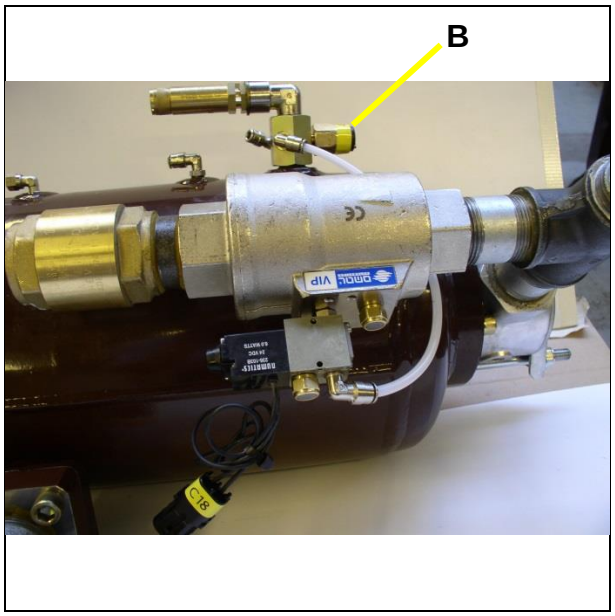
EQUIPMENT	**Pressure Switches – Compressor CAFS200**

PRESSURE SWITCH A AND B – CAFS200

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.





1. Pressure swtich (A in photograph) is closed. In operation at 1 bar pressure it will open until compressor pressure reduces.

2. Check that all the connections are secure. Conduct a continuity test across the two terminals to make sure the sensor is functioning.

3. Pressure sensor (B in photograph) is open. In normal operation at 1 bar pressure it will close. It is acting as a safety interlock device, if no air is sensed, the air ratio control valve in the manifold is set to fully wet. Only a water/foam mixture will discharge from the manifold.

4. Check that all the connections are secure. Conduct a continuity test across the two terminals to make sure the switch is functioning.

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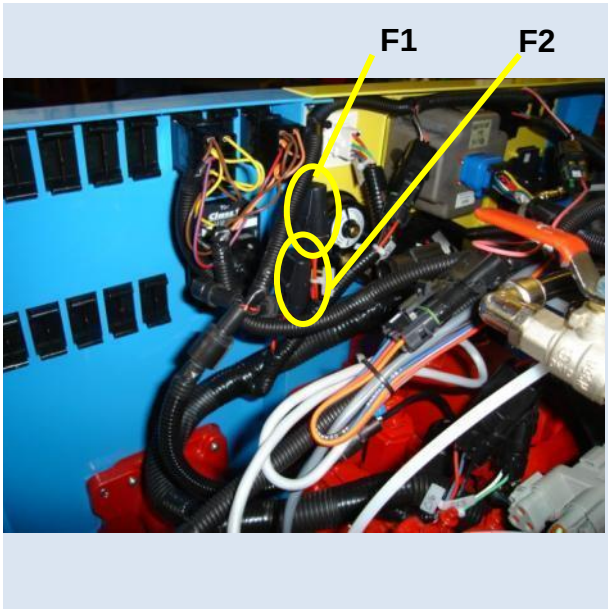
CORRECTIVE MAINTENANCE PROCEDURE
CM-017

EQUIPMENT	**Electrics**

FUSES

WARNING! BEFORE WORKING ON THE EQUIPMENT, MAKE SURE THAT IT IS ISOLATED AND WARNING NOTICES ARE DISPLAYED.

WARNING! EQUIPMENT WILL REMAIN HOT AFTER THE PUMP HAS STOPPED. WAIT FOR IT TO COOL BEFORE MAINTENANCE STARTS.



1. The pump operates with two fuse units, attached to the rear of the instrument panel (F1) and (F2).
Note: this is the same location for CAF50, 100 and 200 models.

2. Fuse F1 relates to the warning lights. Fuse F2 relates to the compressor

2. If a fuse has broken, the entire unit will not function. In the event of a system failure, check both the fuses and replace if necessary.

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9. PARTS LISTS

PRIMA SMARTCAFS50 - ILLUSTRATED PARTS LIST
Godiva Ltd. Prima SmartCAFS Spares Manual GP/275.

FOAMLOGIX - ILLUSTRATED PARTS LIST
Refer to the **FoamLogix** Installation and Operations Manual in Section 11, Appendix.

COMPRESSOR - ILLUSTRATED PARTS LIST
Refer to the **Gardener Denver** Tamrotor Tempest 3 Manual in Section 11, Appendix.

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GODIVA Prima SmartCAFS

PC2 Models - VEHICLE MOUNTED TWIN PRESSURE PUMP
with Integrated SmartCAFS50

Spares Manual

Publication number: GP/275 Issue 8, May 2023

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AMENDMENT RECORD

Model: Prima SmartCAFS50

Mod No.	Date	Page/s	Amendment	Issue No.
1	August 2010	All	New Issue	Issue 1
2	March 2012	32	Item 1 CAFS type outriggers detailed on pages 70-73	Issue 2
3	March 2012	83	Item 23 – see page 87 for details	Issue 2
4	March 2012	73	Item 1 – Gunmetal option is 65421/100	Issue 2
5	March 2012	79	Add complete Tensioner Assembly 65447/002	Issue 2
6	August 2012	14-15	Add O ring UMP9700	Issue 3
7	Sept 2013	45	Item 1 was 65459 is now 60233/02	Issue 4
8	April 2022	57	Changed screws 16 and 18 on page 57 to a harder material	Issue 5
9	April 2022	60	Added 54344/07 & 082-10406-000 elbows to pipe work see image on page 60	Issue 5
10	June 2022	45	Adjusted invalid parts 64737MA to 54737MA (Item 13)	Issue 6
11	October 2022	82,84,85,86,87	Added a new warning lamp backing plate 68280	Issue 7
12	May 2023	43	M6 Nuts changed from MS35/7 to MS41/4 on Priming Valve Assembly	Issue 8

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introduction

This publication provides comprehensive detail of available maintenance and repair items appropriate to the Godiva Prima vehicle mounted pump. Supplementary information to previous publications may be found here concerning Warnings, Cautions and Safety.

IMPORTANT NOTES

Spares

Use only approved replacement parts as recommended by Godiva Ltd. Use of non-approved parts or unauthorised modification of the Godiva Prima Fire Pump may result in death or injury and invalidate any product warranty.

Ordering

When ordering replacement parts please state:

- Model – e.g Prima twin pressure, aluminum or bronze pump
- Serial number – *this is a six figure number stamped on the main pump body or on a plate in the vehicle bay*
- Year of manufacture
- Part description
- Part number
- Quantity required

Pump

Godiva products may only be repaired or serviced by persons trained in said procedures by either Godiva Ltd., or their approved agents.

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SAFETY RELEVANT DATA

Thank you for purchasing a Godiva Pump.

Godiva Pumps are designed to give safe and reliable service. BEFORE use, it is essential that the Operating and Installation Instructions are carefully read and understood.

Maintenance

It is the responsibility of the user to ensure that the equipment is maintained in a safe operational condition. Local legislative conditions may apply. UK only, Maintenance (Regulation 5) of the Provision and Use of Work Equipment Regulations 1998 applies.

Training

It is ESSENTIAL that Godiva pumps are operated ONLY by TRAINED PERSONNEL. Please contact Godiva Ltd to discuss your training needs. Follow the operating procedures laid down in this document and avoid personal injury.

Safety Points

The following points apply mainly to pumps driven by petrol, diesel or other means:



The exhaust system, manifolds and turbocharger become VERY HOT in use, DO NOT TOUCH. Allow the system to cool before maintenance or inspection.

DO NOT REMOVE the radiator pressure cap if the engine is either hot or running.

DO NOT OPERATE the unit close to flammable materials or structures.

ENSURE that exhaust fumes are safely ventilated.

DO NOT SMOKE while operating the unit.

DO NOT inhale fumes or gases.

DO NOT REFUEL unless the engine is stationary and COLD.

ENSURE that the fuel cap is secure and DO NOT overfill the tank.

Avoid prolonged skin contact with fluids, particularly if corrosive or carcinogenic.

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When in use, keep ALL UNTRAINED people AWAY from the unit.

Where appropriate, eye protection should be worn.

DO NOT run the engine with the alternator or batteries disconnected.

Disconnect the negative (-ve) battery lead first and reconnect last.

Isolate the electrical supply when working on the pump.

Avoid battery spillage.

Batteries produce EXPLOSIVE GASES, do not expose to sources of heat and naked flames.

DO NOT lift heavy weights without assistance.

DO NOT remove protective guards or shields.

Noise
Operators must wear suitable EAR PROTECTION when the pump is running.

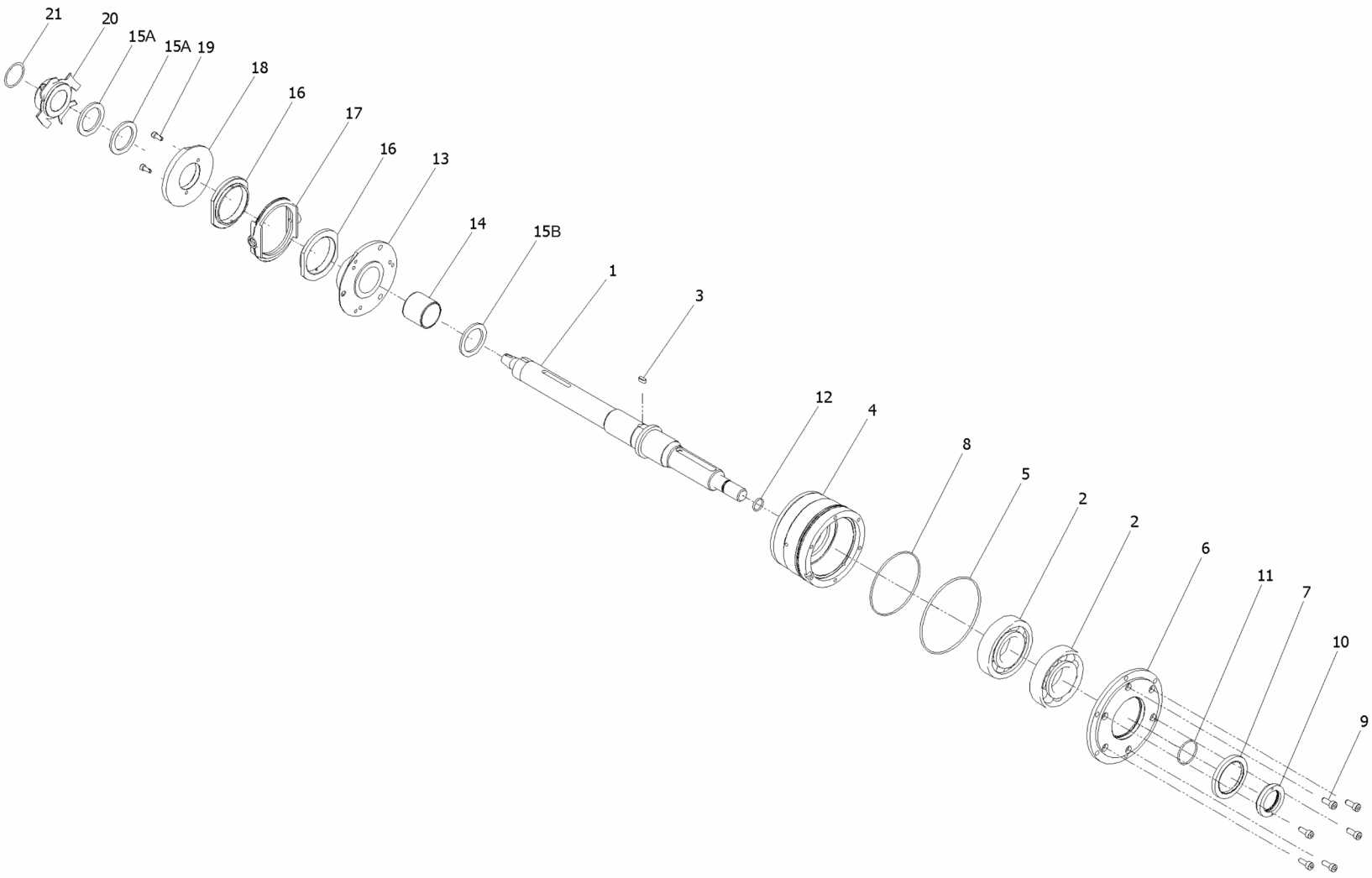
ENVIRONMENTAL PROTECTION

It is prohibited to pour engine oil and other contaminants onto the ground, down sewers, drains, or into water courses.
Dispose of lubricants through authorised waste disposal contractors, licensed waste disposal sites, or to the waste reclamation trade.
If in doubt, contact your Local Environmental Agency for advice regarding disposal policies.

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Bearing Housing Shaft – illustration



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Bearing Housing Shaft – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	PUMP SHAFT-TWIN PRESSURE G/BOX	1	65028/002	65028/002	
2	BEARING - ANG. CONTACT	2	60002	60002	
3	KEY, SQ PAR'L 6x6x15	1	MS79/44	MS79/44	
4	ELECTRO-MAGNETIC CLUTCH 24V	1	65017/004	65017/004	
5	O-RING	1	53526	53526	
6	HOUSING-SEAL	1	65019/001	65019/001	
7	OIL SEAL - 60x80x7	1	60012	60012	
8	O-RING	1	65171	65171	
9	SCREW, SS SKT HD CAP M8x20	6	MS164/20	MS164/20	
10	SEAL WEAR RING	1	60141	60141	
11	O-RING ID 41.6 x 2.4	1	51355	51355	
12	O-RING I/D 19.6 x 2.4	1	57044	57044	
13	ECCENTRIC DRIVE	1	65021/005	65021/005	
14	DU BEARING	1	56949/008	56949/008	
15A 15B	SHIM PACK	3	65166/-	65166/-	See table on next page for options
16	SLIDER BUSH	2	65121/001	65121/001	
17	YOKE	1	65012/302	65012/302	
18	BALANCE WEIGHT	1	65022/003	65022/003	
19	SS SKT HD CAP M6x1.0 T/LOC	2	65169/001	65169/001	
20	SPACER/FLINGER	1	65025/003	65025/003	
21	O-RING I/D 37.6x2.4	1	UMP9700	UMP9700	

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GODIVA Prima SmartCAFS

Bearing Housing - Shim Details

Items 15A - Select pair of shim spacers to give minimum clearance for free rotation

Item 15B - Select shim spacer to give 0.24 / 0.40 air gap on clutch

SHIM SPACER COMBINATION

	4.0	4.1	4.2	4.3	4.4	4.5	5.1
PACK THICKNESS	PART No 65166	PART No 65166/001	PART No 65166/002	PART No 65166/003	PART No 65166/004	PART No 65166/005	PART No 65166/006
COLOUR	BLACK	WHITE	RED	BLUE	GREEN	YELLOW	ORANGE
8.0	QTY 2						
8.1	QTY 1	QTY 1					
8.2	QTY 1		QTY 1				
8.3	QTY 1			QTY 1			
8.4	QTY 1				QTY 1		
8.5	QTY 1					QTY 1	
8.6				QTY 2			
8.7				QTY 1	QTY 1		
8.8				QTY 1		QTY 1	
8.9					QTY 1	QTY 1	
9.0						QTY 2	
9.1	QTY 1						QTY 1
9.2		QTY 1					QTY 1
9.3			QTY 1				QTY 1
9.4				QTY 1			QTY 1
9.5					QTY 1		QTY 1
9.6						QTY 1	QTY 1

ALTERNATIVE COMBINATION

	4.1	4.2	4.3	4.4	4.5
PACK THICKNESS	PART No 65166/001	PART No 65166/002	PART No 65166/003	PART No 65166/004	PART No 65166/005
COLOUR	WHITE	RED	BLUE	GREEN	YELLOW
8.2	QTY 2				
8.3	QTY 1	QTY 1			
8.4	QTY 1		QTY 1		
8.5	QTY 1			QTY 1	
8.6	QTY 1				QTY 1
8.7		QTY 1			QTY 1
8.8				QTY 2	

ALTERNATIVE COMBINATION

	4.2	4.3
PACK THICKNESS	PART No 65166/002	PART No 65166/003
COLOUR	RED	BLUE
8.4	QTY 2	
8.5	QTY 1	QTY 1

Shim Pack Details for item 27 on page 14, 16

	0.002"	0.005"	0.010"	0.015"
PACK THICKNESS	PART No 60095/01	PART No 60095/02	PART No 60095/03	PART No 60095/04
0.002"	QTY 1			
0.004"	QTY 2			
0.005"		QTY 1		
0.006"	QTY 3			
0.007"	QTY 1	QTY 1		
0.008"	QTY 4			
0.009"	QTY 2	QTY 1		
0.010"			QTY 1	
0.011"	QTY 3	QTY 1		
0.012"	QTY 1		QTY 1	
0.013"	QTY 4	QTY 1		
0.014"	QTY 2		QTY 1	
0.015"				QTY 1
0.016"	QTY 3		QTY 1	
0.017"	QTY 1	QTY 1	QTY 1	
0.018"	QTY 4		QTY 1	
0.019"	QTY 2			QTY 1
0.020"			QTY 2	
0.021"	QTY 3			QTY 1
0.022"	QTY 1		QTY 2	
0.023"	QTY 4			QTY 1
0.024"	QTY 2		QTY 2	
0.025"			QTY 1	QTY 1
0.026"	QTY 3		QTY 2	
0.027"	QTY 1	QTY 1	QTY 2	
0.028"	QTY 4		QTY 2	
0.029"	QTY 2		QTY 1	QTY 1
0.030"				QTY 2

Item 18 Drive Flange Options

Type	Piston Primer pump	
SAE 1410	65460	
SAE 1510	65460/001	
DIN 100	65460/002	
DIN 120/8	65460/003	

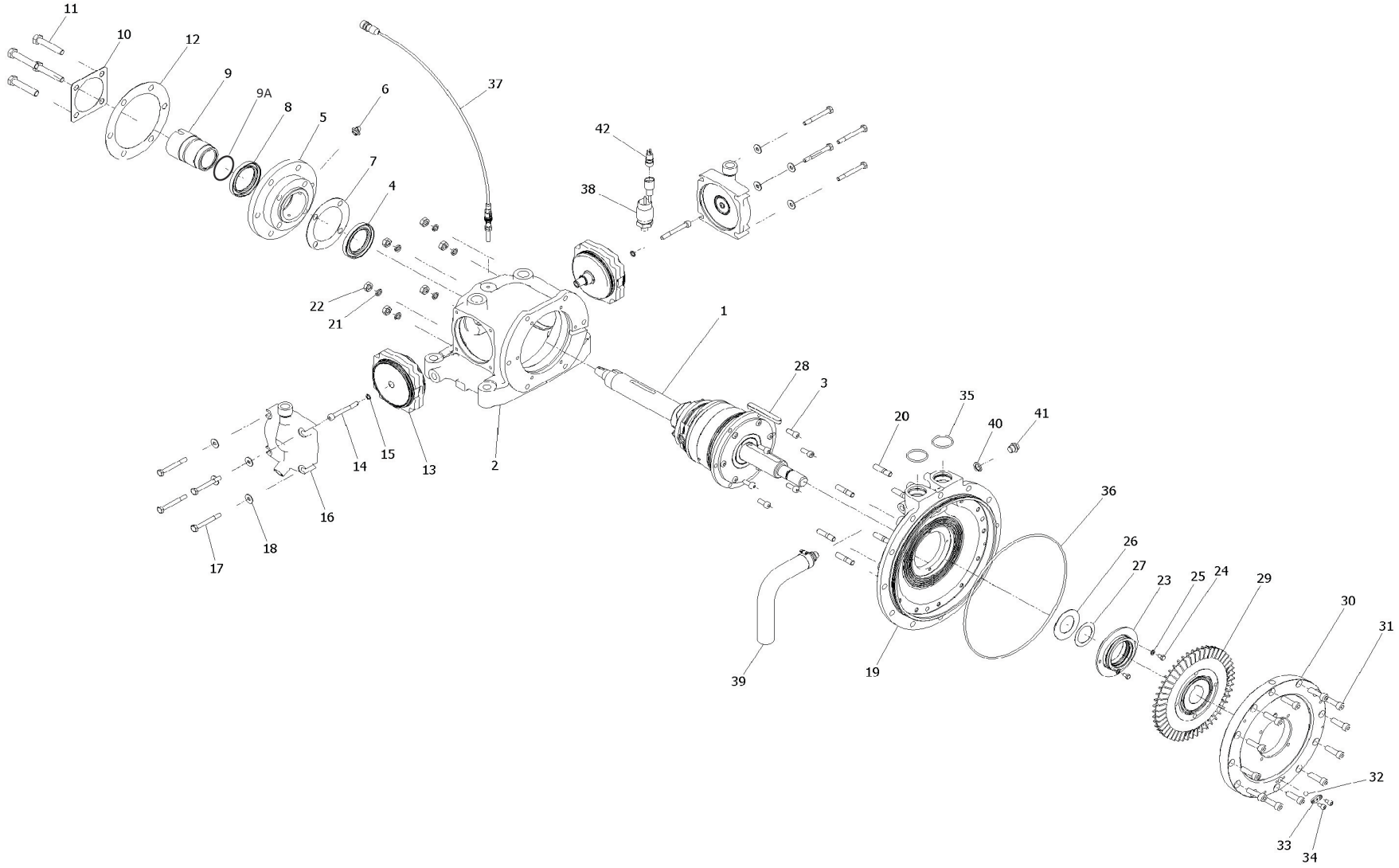
IDEX FIRE SUPPRESSION GROUP

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Bearing Housing, Pump Head and HP Impeller - illustration



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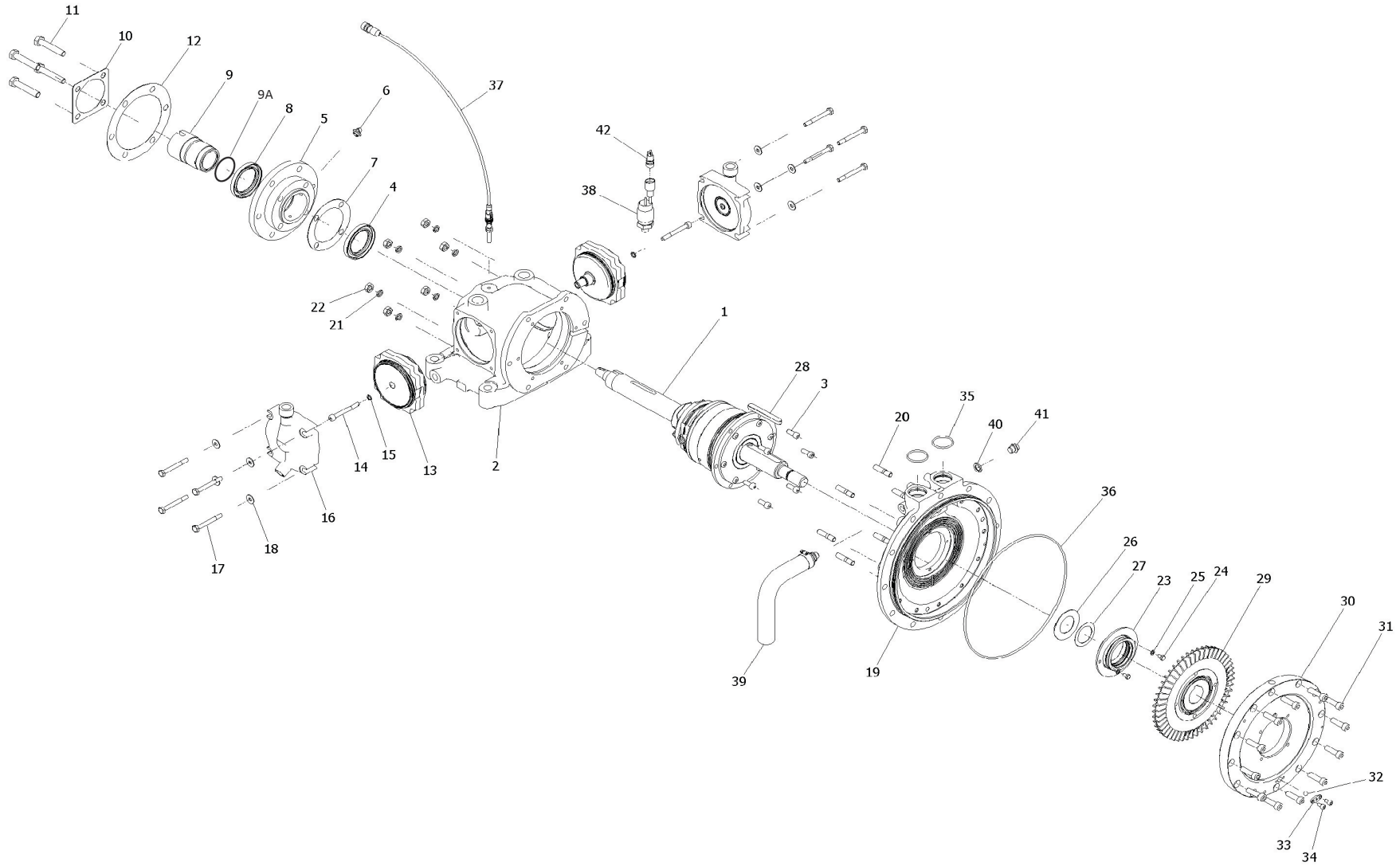
Bearing Housing, Pump Head and HP Impeller – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	SHAFT ASSEMBLY, P2, with gearbox	1	65136/001	65136/001	
2	HOUSING BEARING	1	65000/300	65000/300	
3	SCREW, SS SKT HD CAP M8x20	6	MS164/20	MS164/20	
4	OIL SEAL 55x80x8	1	65128/001	65128/001	
5	ADAPTOR RING	1	65127	65127	
6	SNAP FIT PLUG	1	65244	65244	
7	GASKET ADAPTOR RING	1	65182	65182	
8	OIL SEAL 58x80x8	1	65128	65128	
9	SPACER SHAFT LOCKING	1	65129	65129	Also order item 9A – O ring
9A	O RING	1	UMP9700	UMP9700	Ordered with item 9
10	TAB WASHER PLATE	1	61269/001	61269/001	
11	BOLT, HEX HD M12x65	4	MS19/65	MS19/65	
12	ADAPTOR RING GASKET	1	61197	61197	
13	PISTON & CYLINDER ASSEMBLY	2	65135	65135	
14	SS SKT HD CAP M8x1.25 T/LOC	2	65169	65169	
15	BONDED SEAL M8 SELFCENTER	2	MS133/8	MS133/8	
16	END COVER ASSEMBLY	2	65172	65172	
17	BOLT, HEX HEAD M8x70	8	MS17/70	MS17/70	
18	WASHER, LARGE HEAVY M8	8	MS27/4	MS27/4	
19	PUMP BODY	1	65070/200	65070/200	
20	STUD, M10x30	6	MS49/30	MS49/30	
21	WASHER, SPRING SQ M10	6	MS29/7	MS29/7	
22	NUT, FULL M10	6	MS35/9	MS35/9	
23	MECHANICAL SEAL ASSEMBLY	1	65131	65131	
24	SCREW, SS HEX HEAD M6x10	2	MS104/10	MS104/10	

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Bearing Housing, Pump Head and HP Impeller - illustration



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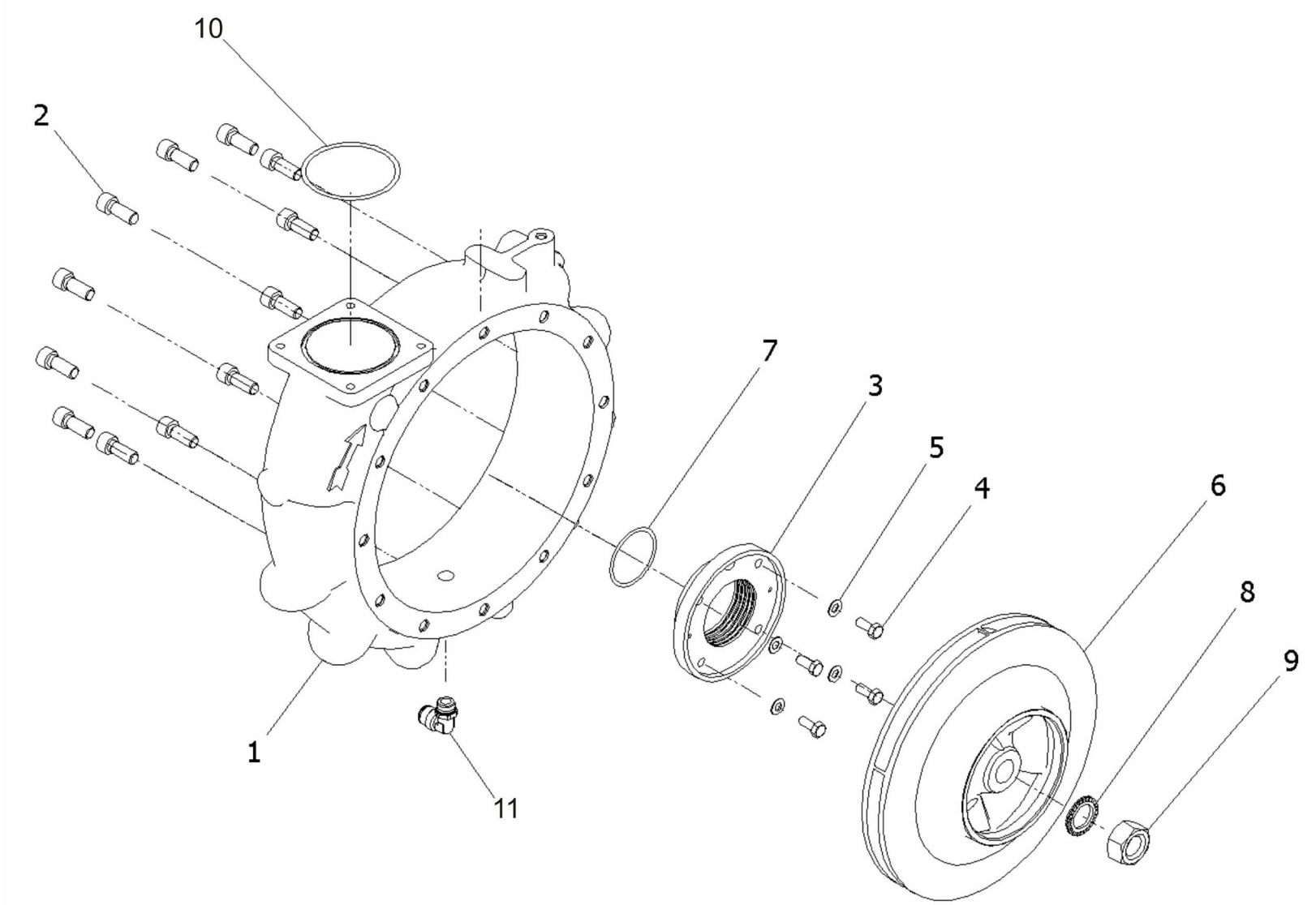
Bearing Housing, Pump Head, HP Impeller – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
25	BONDED SEAL M6 SELF CENTERING	2	MS133/6	MS133/6	
26	FLINGER	1	60014	60014	
27	SHIM 56 O/D	1	60095/-	60095/-	
28	KEY, RECT PARALLEL 12x8x90	1	MS180/31	MS180/31	
29	HIGH PRESSURE IMPELLER	1	65120	65120	
30	COVER PLATE HIGH PRESSURE H.V.	1	65040	65040	
31	SCREW, SS SKT HD CAP M10x35	12	MS165/35	MS165/35	
32	BALL Ø9 ST. ST.	1	65003	65003	
33	PLATE - HP DRAIN	1	65002	65002	
34	SCREW, SKT HD CAP M6x10	2	MS163/10	MS163/10	
35	O-RING	2	65137	65137	
36	O-RING	1	65097	65097	
37	TACHO SENDER UNIT	1	60015/001	60015/001	
38	PRESSURE SWITCH	1	65141	65141	
39	PRESSURE RELIEF ASSEMBLY	1	65414	65414	
40	BONDED SEAL ¼" BSP SELF CENTRE	1	UFP2303/5	UFP2303/5	
41	PLUG SHOULDER ¼" BSP	1	S64/2	S64/2	
42	OEM AUTO PRIMER CONNECTION	1	65628	65628	

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Volute and Low Pressure Impeller - illustration



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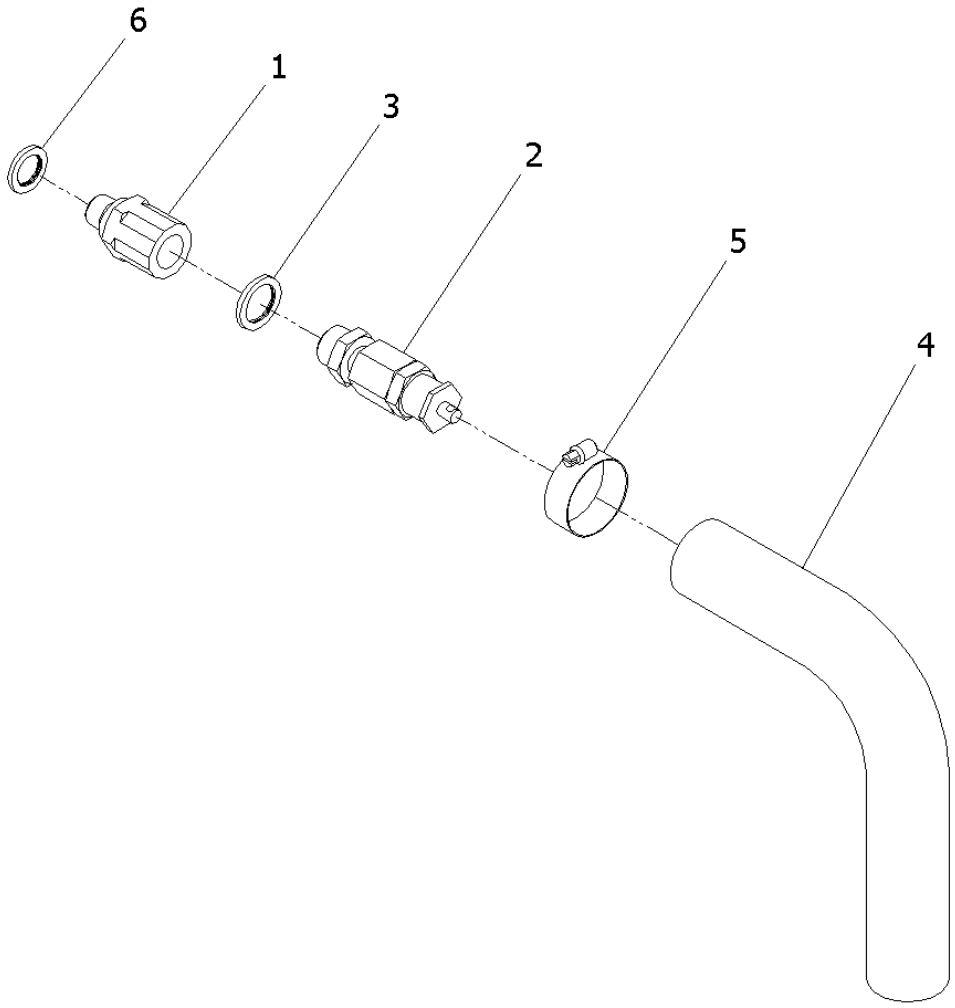
Volute and Low Pressure Impeller - illustration

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	VOLUTE BODY	1	65095/000	65095/100	2010/3010 Model
-		1	65096/000	65096/100	4010/6010 Model
2	SCREW, SS SKT HD CAP M12x30	12	MS166/30		
3	WEAR RING REAR	1	65004	65004	2010/3010 Model
-			65004/001	65004/001	4010 Model
4	HEX HEAD SCREW	4	65405		
5	WASHER, SPECIAL M8	4	MS126/9		
6	IMPELLER – LH Outlet	1	60304	60304/100	2010/3010 Model
-		1	60319	60319/100	4010 Model
-		1	60834	60834/100	6010 Model
-	IMPELLER – RH Outlet	1	60028	60028/100	2010/3010 Model
-		1	60196	60196/100	4010 Model
-		1	60841	60841/100	6010 Model
7	O-RING ID 56.4 x 2.4	1	57204		
8	LOCK WASHER PAIR - NL24 SS G	1	60072/06		
9	NUT, SS FULL M24	1	65181		
10	O-RING ID 84.5 x 3	1	THM11034	THM11034	2010/3010 Model
-		1	52649	52649	4010/6010 Model
11	SWIVEL ELBOW CONN 12-3/8"	1	59189/02		

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Pressure relief valve – illustration



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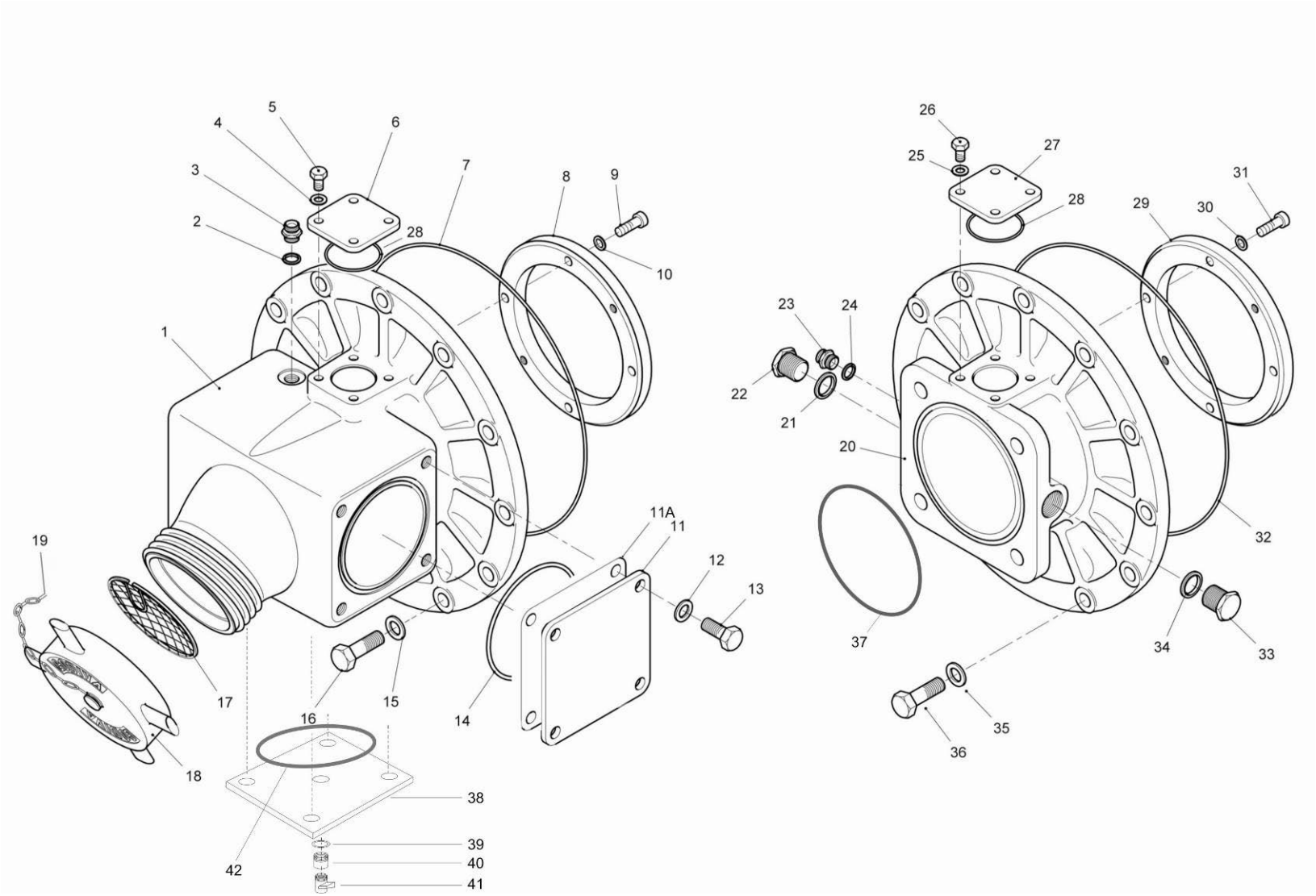
Pressure relief valve – list

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	PRESSURE RELIEF ADAPTOR	1	65413	65413	
2	PRESSURE RELIEF	1	60388	60388	
3	BONDED SEAL 3/8" BSP SELFCENTER	1	UFP2303/7	UFP2303/7	
4	RUBBER ELBOW	1	65661	65661	
5	HOSE CLIP , HEAVY RANGE 25-40	1	MS82/5	MS82/5	
6	BONDED SEAL ¼" BSP SELF CENTRE	1	UFP2303/5	UFP2303/5	

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Suction Tube Group – illustration – 2010 Model



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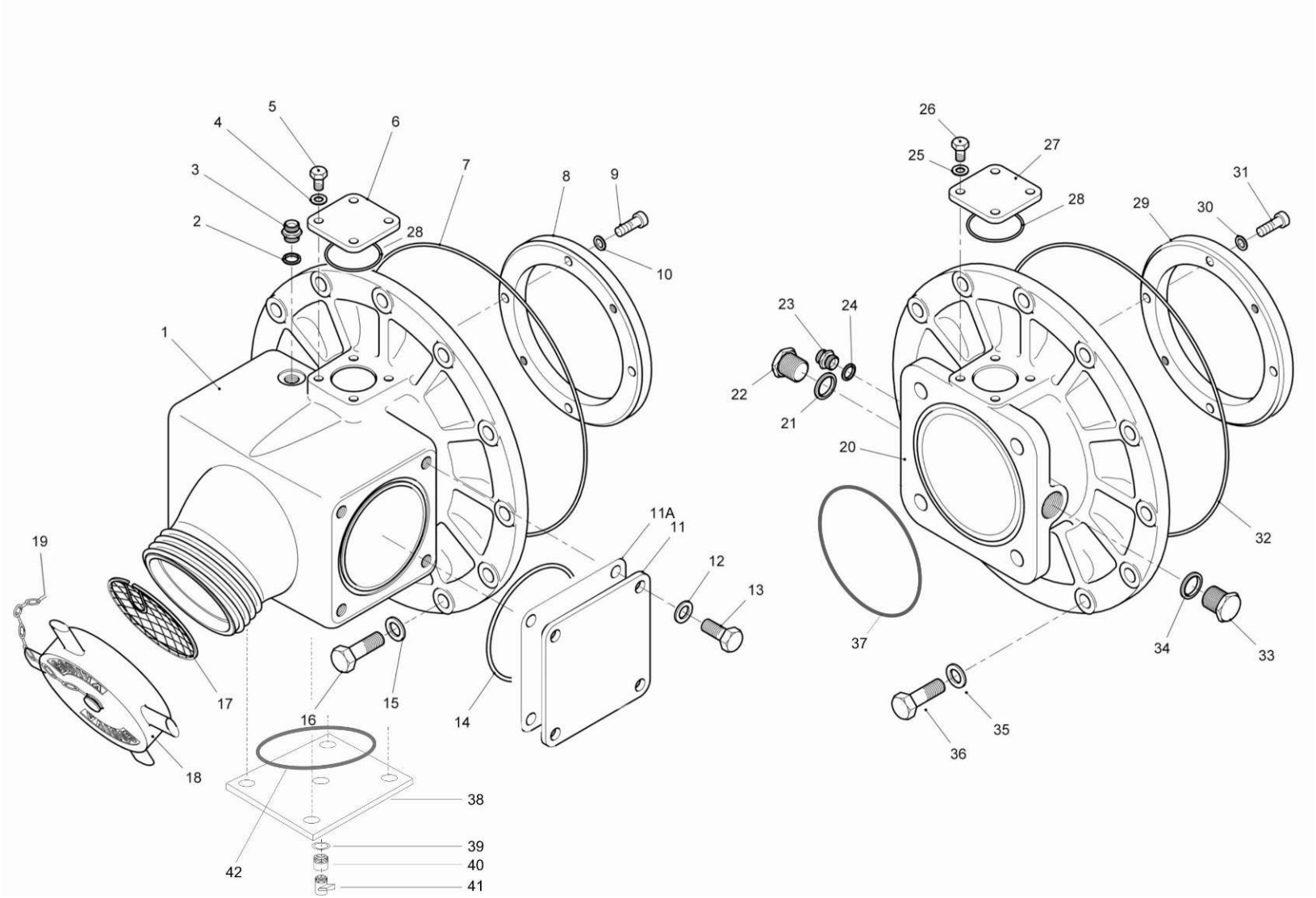
Suction Tube Group – List – 2010 Model

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	Suction tube, 2010, 25° angle, 4” R.T.	1	65074/000	65074/100	
2	Seal	1	UFP2303/5	UFP2303/5	
3	Union, for gauge connection	1	56403	56403	
4	Washer	4	MS25/9	MS25/9	
5	Screw	4	MS05/20	MS05/20	
6	Plate, RTP blanking	1	60168	60168	
7	O ring, suction tube to volute	1	65097	65097	
8	Wear ring, front	1	65078	65078	
9	Screw, socket head	4	MS164/25	MS164/25	
10	Washer	4	MS125/9	MS125/9	
11	Blanking plate	1	65189	65189	
11A	Shim, Blanking plate	1	65483	65483	
12	Washer, blanking plates, side and bottom location	8	MS25/11	MS25/11	
13	Screw, blanking plates, side and bottom location	8	MS07/30	MS07/30	
14	O ring, blanking plate	3	65406	65406	
15	Washer	12	MS25/11	MS25/11	
16	Bolt	12	MS19/45	MS19/45	
17	Strainer	1	52125/01	52125/01	
18	Cap, suction tube	1	FWP2004	UFP7632	
19	Chain	1	FWP1062/1	FWP1062/1	
-	Chain anchor	1	65502	65502	
20	Suction flange, 175 DIN Sq	1	65073/000	65073/100	
21	Seal	1	UFP2303/8	UFP2303/8	
22	Plug	1	S64/4	S64/4	
23	Union	1	56403	56403	
24	Seal	1	UFP2303/5	UFP2303/5	

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Suction Tube Group – illustration – 2010 Model



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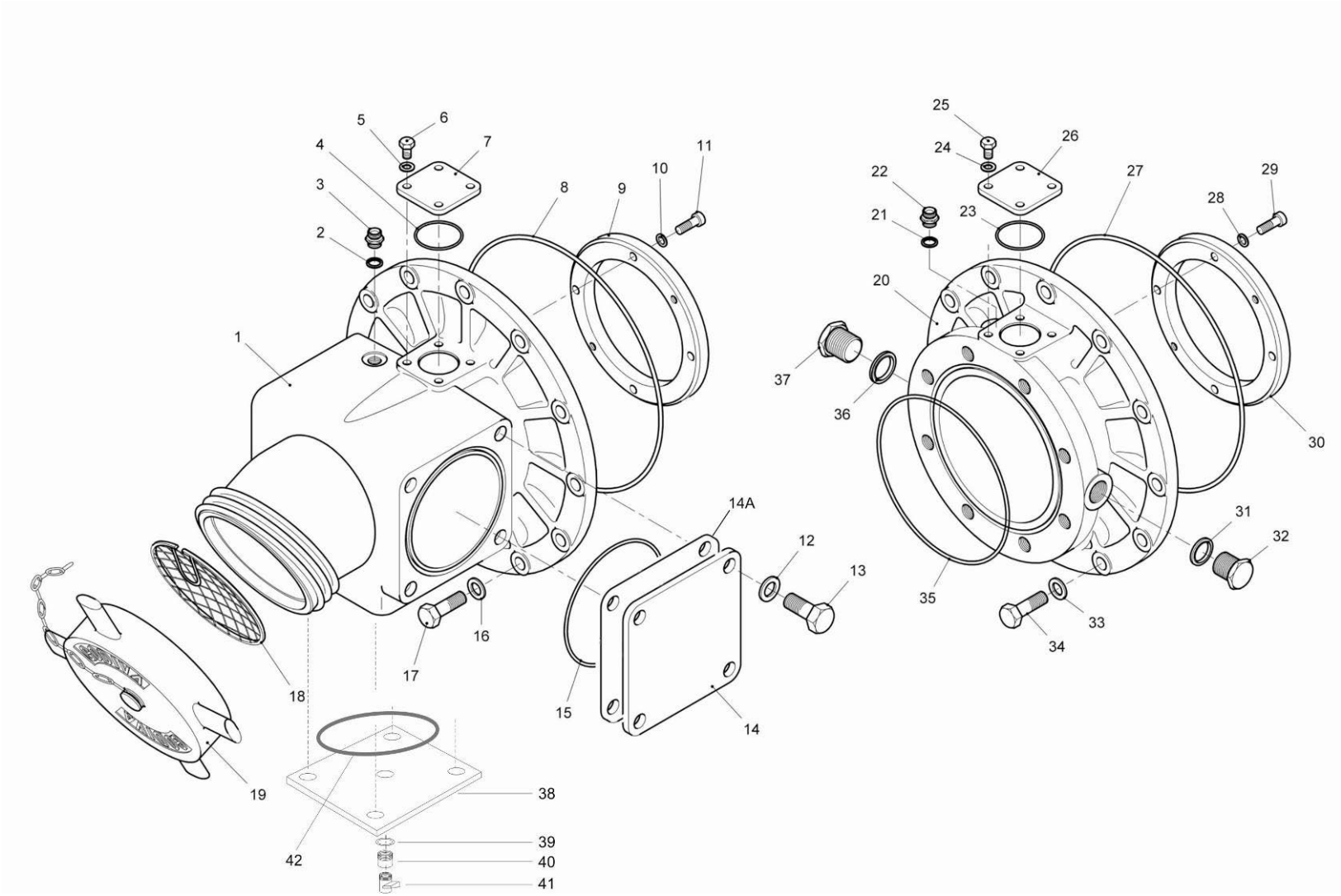
Suction Tube Group – List – 2010 Model

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
25	Washer	4	MS25/9	MS25/9	
26	Screw	4	MS05/20	MS05/20	
27	Plate, RTP blanking	1	60168	60168	
28	O ring	1	51355	51355	
29	Front wear ring	1	65078	65078	
30	Washer	4	MS125/9	MS125/9	
31	Screw	4	MS164/25	MS164/25	
32	O ring	1	65097	65097	
33	Plug	1	S64/6	S64/6	
34	Seal	1	UFP2303/10	UFP2303/10	
35	Washer	12	MS25/11	MS25/11	
36	Bolt	12	MS19/45	MS19/45	
37	O ring, suction tube flange	1	GPL10564	GPL10564	
38	Blanking plate, bottom, with drain	1	65189/002	65189/002	
39	Seal	1	UFP2303/8	UFP2303/8	
40	Adaptor	1	65503/001	65503/001	
41	Drain valve	1	65214/001	65214/001	
42	O ring	1	65406	65406	

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Suction Tube Group – illustration – 3010 / 4010 Model



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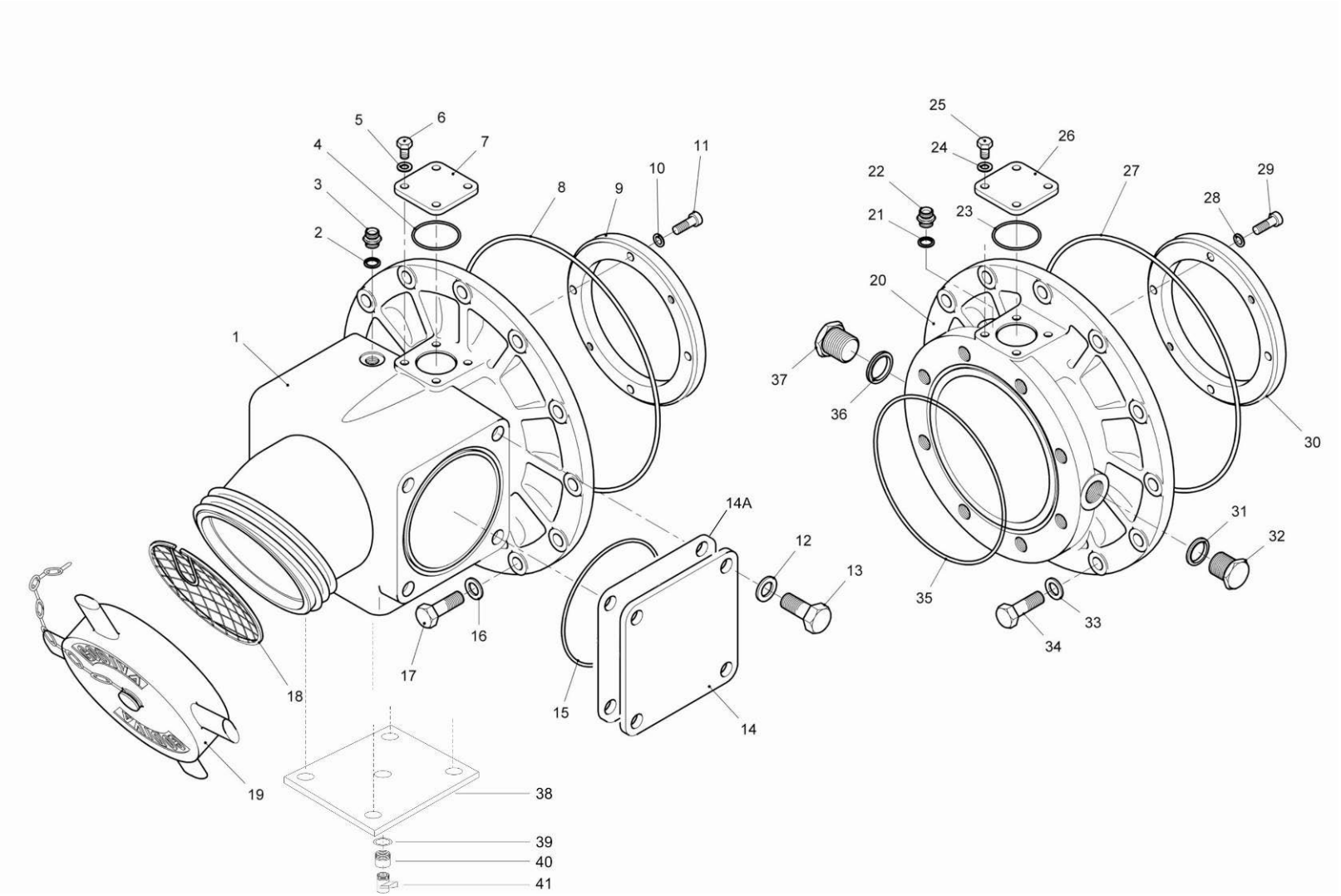
Suction Tube Group – List – 3010 / 4010 Model

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	Suction tube, 3010, 25° angle, 5½ R.T.	1	65075/000	65075/100	
	Suction tube, 4010, 25° angle, 5½ R.T.	1	65076/000	65076/100	
2	Seal	1	UFP2303/5	UFP2303/5	
3	Union, for gauge connection	1	56403	56403	
4	O ring	1	51355	51355	
5	Washer	4	MS25/9	MS25/9	
6	Screw	4	MS05/20	MS05/20	
7	Plate, RTP blanking	1	60168	60168	
8	O ring, suction tube to volute	1	65097	65097	
9	Wear ring, front, 3010	1	65078	65078	
-	Wear ring, front, 4010	1	65078/001	65078/001	
10	Washer	4	MS125/9	MS125/9	
11	Screw, socket head	4	MS164/25	MS164/25	
12	Washer	8	MS25/13	MS25/13	
13	Screw	8	MS20/45	MS20/45	
14	Blanking plate	1	65189/001	65189/001	
14A	Shim	1	65483/001	65483/001	
15	O ring	3	65406/001	65406/001	
16	Washer	12	MS25/11	MS25/11	
17	Bolt	12	MS19/45	MS19/45	
18	Strainer 5½”	1	52125/02	52125/02	
19	Suction cap 5½”	1	2112	2112/1	
-	Chain, suction tube cap	1	FWP1062/1	FWP1062/1	
-	Chain anchor	1	65502/001	65502/001	
20	Suction flange, 4010 only, 5” PN16		65163/000	65163/100	
21	Seal	1	UFP2303/5	UFP2303/5	

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Suction Tube Group – illustration – 3010 / 4010 Model



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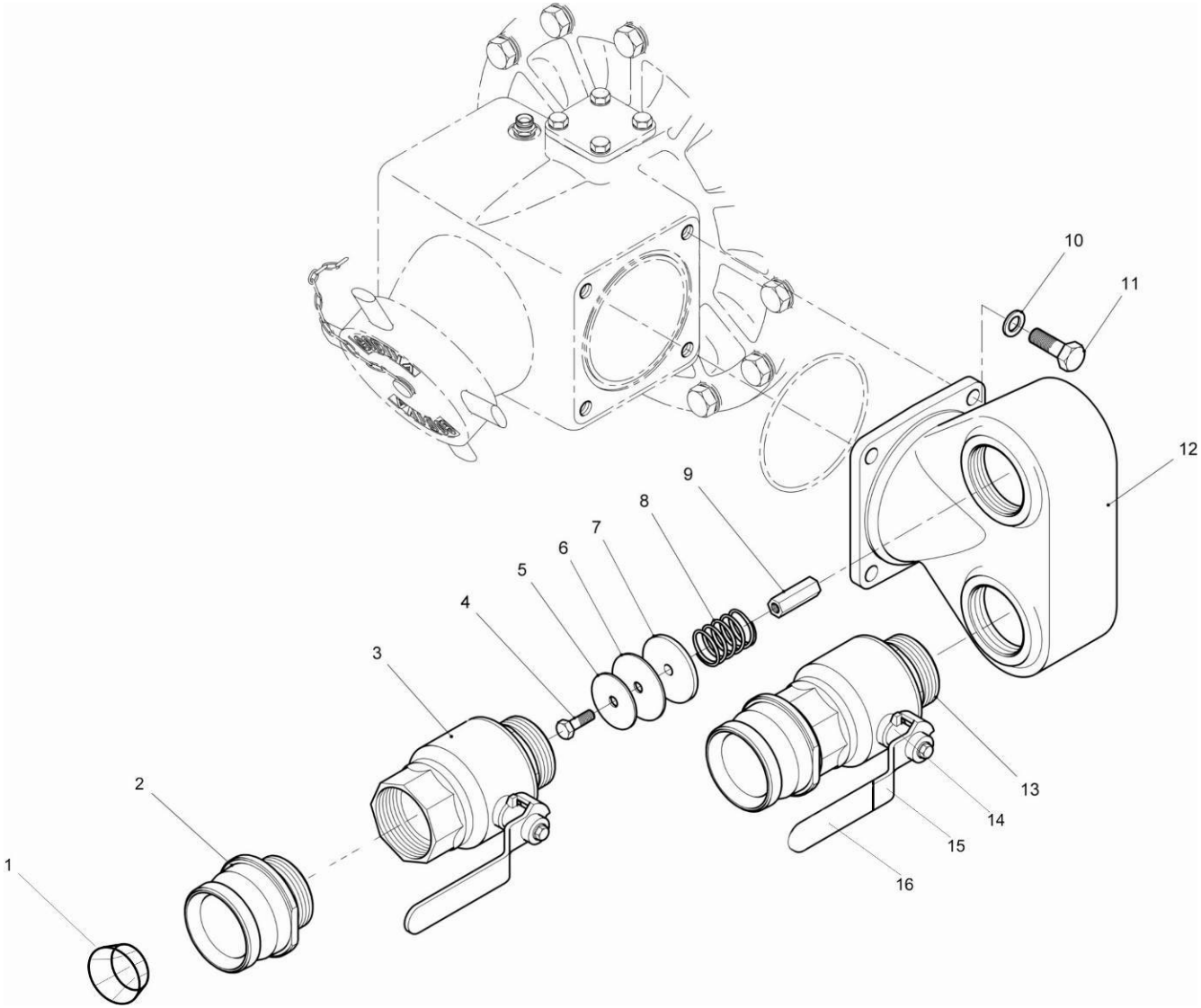
Suction Tube Group – List – 3010 / 4010 Model

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
22	Union, ¼" BSP	1	56403	56403	
23	O ring	1	51355	51355	
24	Washer	4	MS25/9	MS25/9	
25	Screw	4	MS05/20	MS05/20	
26	Plate, RTP blanking	1	60168	60168	
27	O ring, suction tube to volute	1	65097	65097	
28	Washer	4	MS125/9	MS125/9	
29	Screw, socket head	4	MS164/25	MS164/25	
30	Wear ring, front, 4010 only	1	65078/001	65078/001	
31	Seal	1	UFP2303/10	UFP2303/10	
32	Plug	1	S64/6	S64/6	
33	Washer	12	MS25/11	MS25/11	
34	Bolt	12	MS19/45	MS19/45	
35	O ring	1	51177	51177	
36	Seal	1	UFP2303/8	UFP2303/8	
37	Plug	1	S64/4	S64/4	
38	Blanking plate, bottom, with drain	1	65189/0032	65189/003	
39	Seal	1	UFP2303/8	UFP2303/8	
40	Adaptor	1	65503/001	65503/001	
41	Drain valve	1	65214/001	65214/001	
42	O ring	1	65406/001	65406/001	

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Collecting Head Group – illustration



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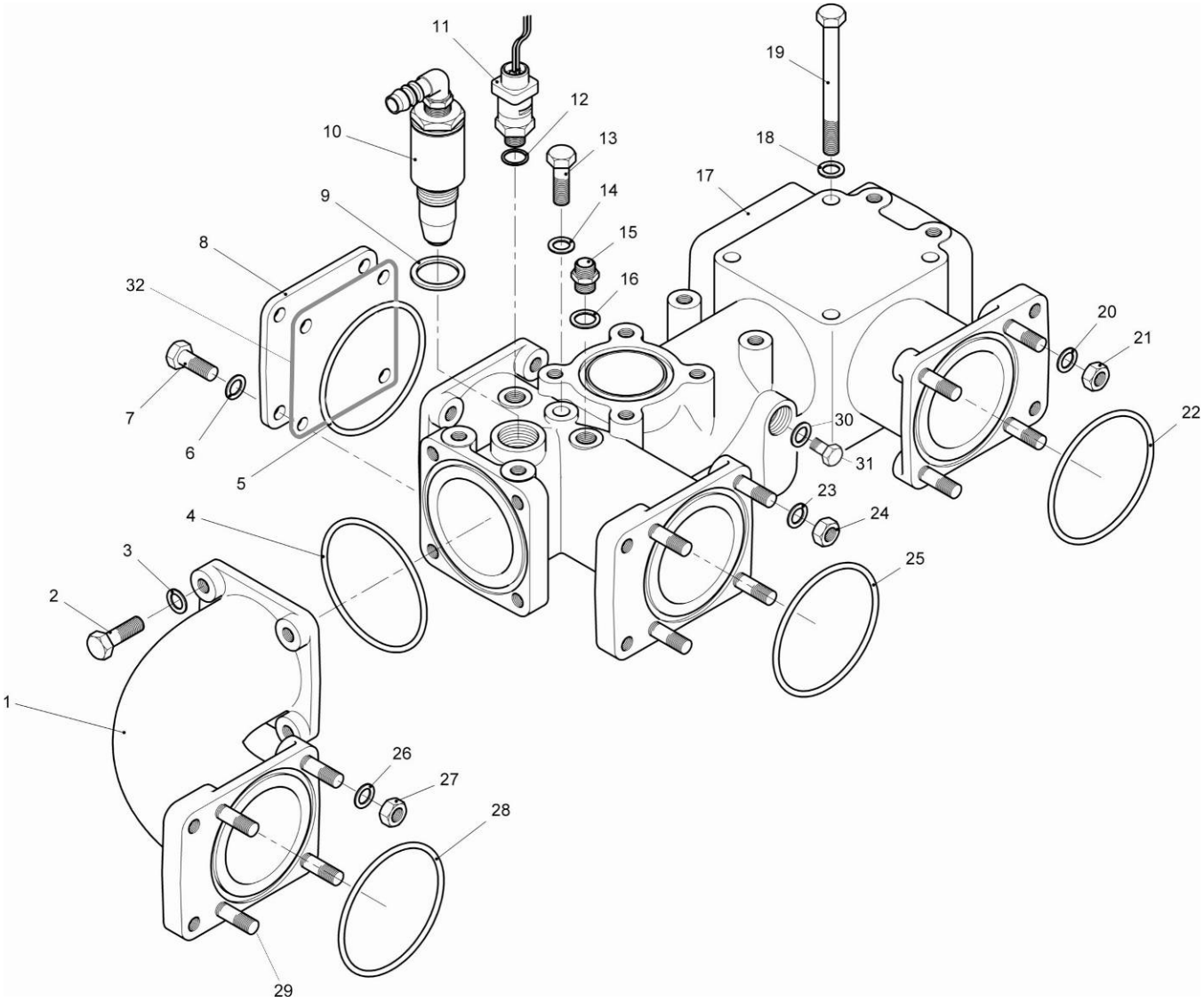
Collecting Head Group – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	Strainer	2	65408	65408	
2	Adaptor, 2” BSP to 2½” I/C	2	65156	65156/100	
3	Ball valve	1	65155	65155	
4	Screw	2	MS105/25	MS105/25	
5	Washer	2	65154	65154	
6	Seal face	2	65153	65153	
7	Washer, spring locating	2	65152	65152	
8	Spring	2	65256	65256	
9	Shaft	2	65151	65151	
10	Washer	4	MS25/11	MS25/11	
11	Screw	4	MS07/35	MS07/35	
12	Body, collecting head – 2010 pump	1	65148/000	65148/100	
-	Body, collecting head – 3010/4010 pump	1	65148/001	65148/001	
13	Ball valve	1	65155	65155	
14	Spacer	1	65485	65485	
15	Handle – Left Hand, Underside assembly	1	65411	65411	
-	Handle – Right Hand assembly	1	65411/001	65411/001	
16	Sleeve – Left Hand assembly	1	65550/006	65550/006	
-	Sleeve – Right hand assembly	1	65550/005	65550/005	
-	Sleeve – Underside assembly	1	65550/002	65550/002	

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Manifold Group – illustration



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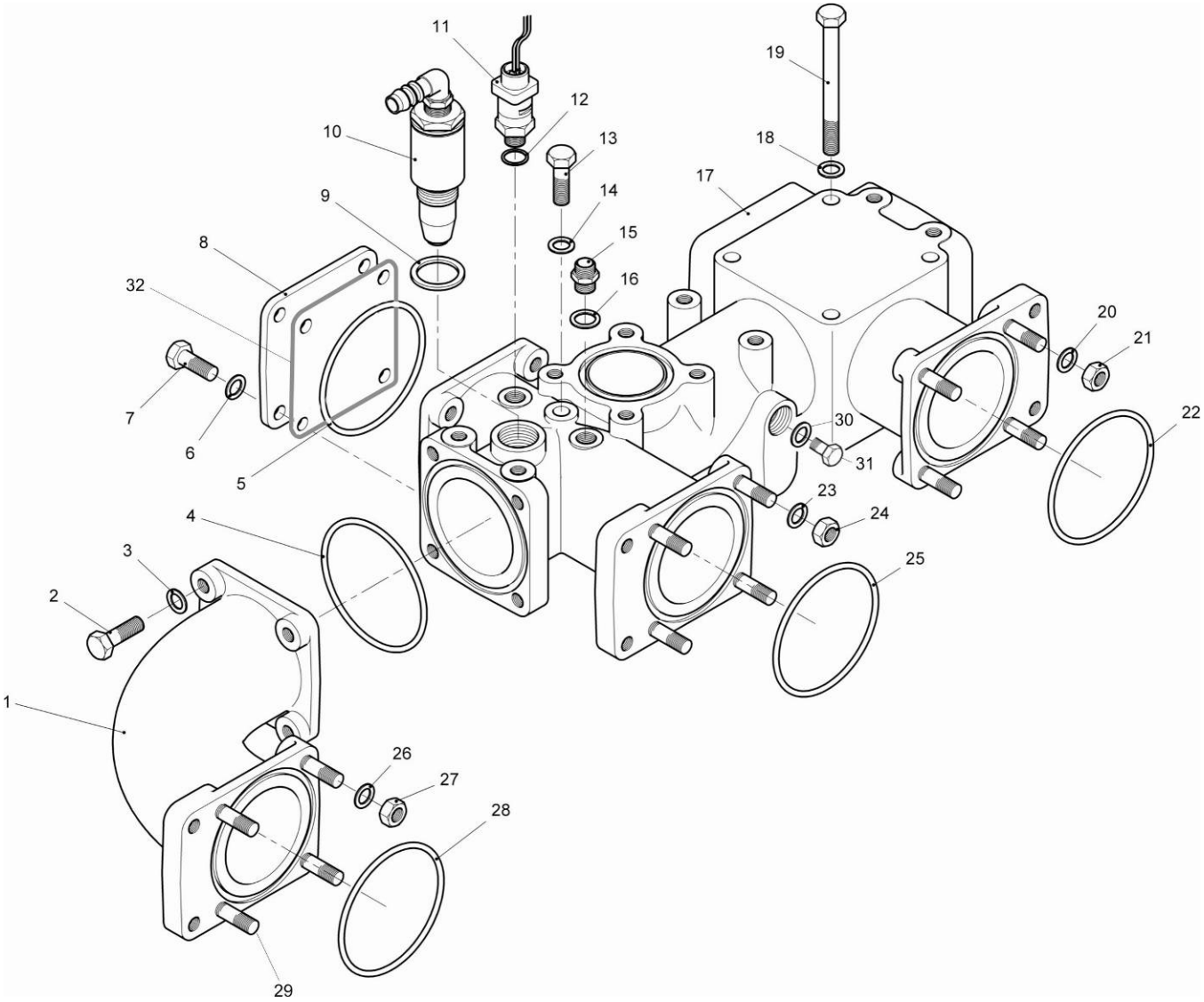
Manifold Group – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	Manifold outrigger	1	-	-	See Pages 70-73 Item 1 for CAFS outriggers
2	Screw	4	MS06/30	MS06/30	
3	Washer	4	MS25/10	MS25/10	
4	O ring	1	50092	50092	
5	O ring	1	50092	50092	
6	Washer	4	MS25/10	MS25/10	
7	Screw	4	MS06/25	MS06/25	
8	Blanking plate	1	51281/09	51281/09	
9	Washer – supplied with item 10	1	-	-	
10	Thermal relief valve - 42°	1	60809	60809	
-	Thermal relief valve - 74°	1	60809/01	60809/01	
11	Pressure switch	1	65141	65141	
12	Washer – supplied with item11	1	-	-	
13	Bolt	1	MS18/130	MS18/130	
14	Washer	1	MS25/10	MS25/10	
15	Union, gauge connection, low pressure	1	56403	56403	
16	Seal	1	UFP2303/5	UFP2303/5	
17	Manifold	1	65036/000	65036/100	
18	Washer	4	MS25/10	MS25/10	
19	Bolt	4	MS18/130	MS18/130	
20	Washer	4	MS25/10	MS25/10	
21	Nut	4	MS35/9	MS35/9	
22	O ring	1	50092	50092	
23	Washer	4	MS25/10	MS25/10	
24	Nut	4	MS35/9	MS35/9	
25	O ring	1	50092	50092	
26	Washer	4	MS25/10	MS25/10	
27	Nut	4	MS35/9	MS35/9	
28	O ring	1	50092	50092	
29	Stud, delivery valves to manifold	4	MS49/25	MS49/25	

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Manifold Group – illustration



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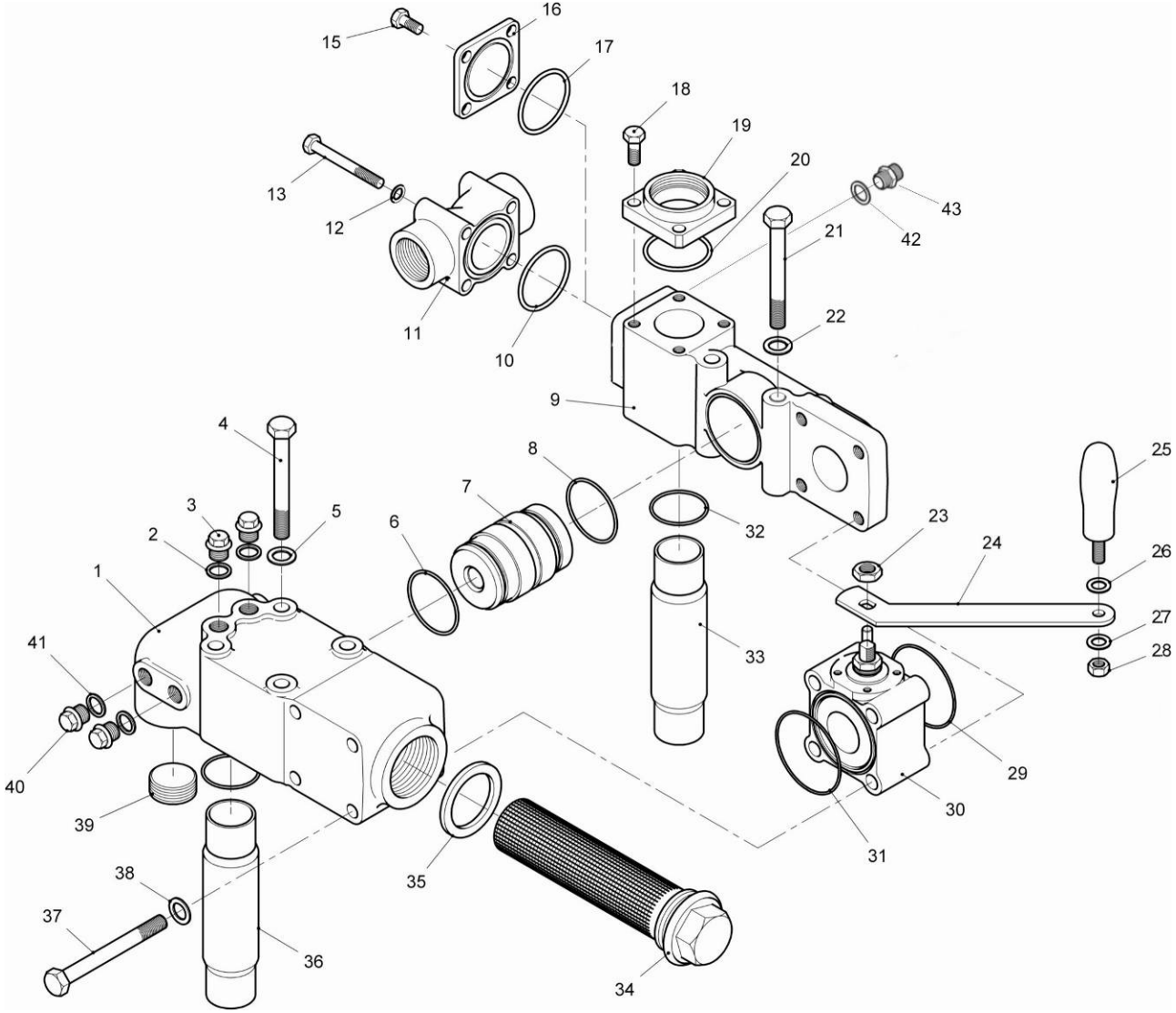
Manifold Group – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
30	Seal	1	UFP2303/8	UFP2303/8	
31	Plug	1	65600	65600	
32	Shim plate	1	60300	60300	

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Filter Housing, Bypass and Relief Valve Group – illustration



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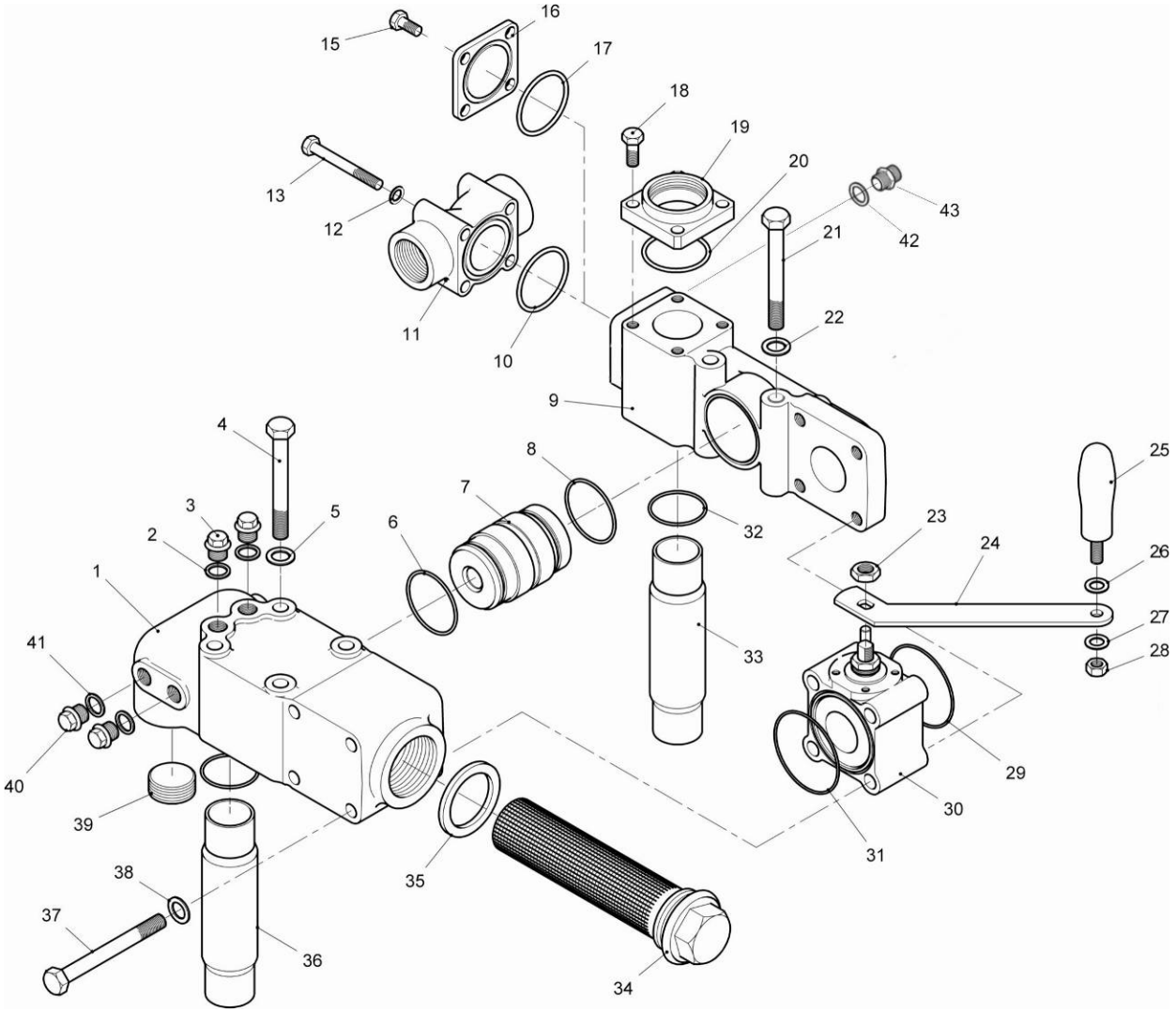
Filter Housing, Bypass and Relief Valve Group – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	Filter body	1	65037/001	65037/101	
2	Seal	2	UFP2303/5	UFP2303/5	
3	Plug	2	S64/2	S64/2	
4	Bolt	4	MS18/100	MS18/100	
5	Washer	4	MS25/10	MS25/10	
6	O ring	1	60166	60166	Also supplied with Item 7
7	Relief valve assembly	1	65099	65099	
8	O ring	1	60166	60166	Also supplied with Item 7
9	By-pass connector	1	65038/000	65038/100	
10	O ring	1	60166	60166	
11	High pressure outlet tee	1	65071/200	65071/200	
12	Washer	4	MS25/9	MS25/9	
13	Bolt	4	MS17/60	MS17/60	
14	Not used				
15	Bolt	4	MS05/20	MS05/20	
16	Sealing plate	1	60168	60168	
17	O ring	1	51355	51355	
18	Screw	4	MS164/25	MS164/25	
19	High pressure outlet plate	1	65190	65190	
20	O ring	1	60166	60166	
21	Bolt	2	MS18/100	MS18/100	
22	Washer	2	MS25/10	MS25/10	
23	Nut	1			Supplied with item 30
24	Handle, ball valve	1	65081/002	65081/002	
25	Handle on item 24	1	60232	60232	

IDEX FIRE SUPPRESSION GROUP

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Filter Housing, Bypass and Relief Valve Group – illustration



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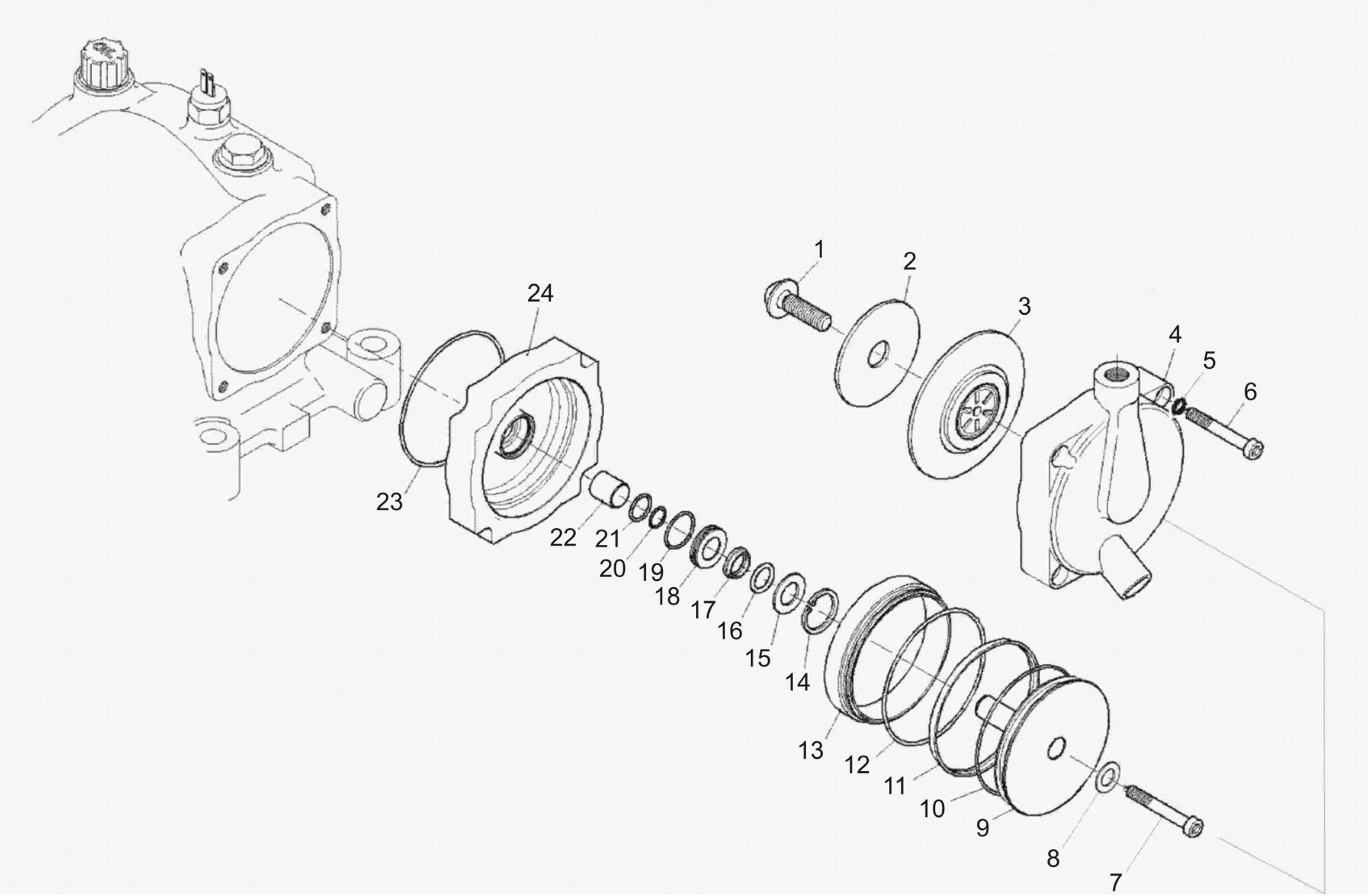
Filter Housing, Bypass and Relief Valve Group – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
26	Washer	1	MS129/5	MS129/5	
27	Washer	1	MS129/5	MS129/5	
28	Nut	1	MS141/5	MS141/5	
29	Supplied as part of valve item 30	1	-	-	
30	High/low pressure selector valve	1	65080	65080	
31	Supplied as part of valve item 30	1	-	-	
32	O ring, transfer tube	2	65137	65137	
33	Transfer tube	1	65079	65079	2010/3010 pump
	Transfer tube	1	65079/001	65079/001	4010 pump
34	Filter assembly	1	60051	60051	
35	Seal	1	UFP2303/15	UFP2303/15	
36	Transfer tube	1	65079	65079	2010/3010 pump
	Transfer tube	1	65079/001	65079/001	4010 pump
37	Bolt	4	MS18/150	MS18/150	
38	Washer	4	MS25/10	MS25/10	
39	Plug	1	60098/05	60098/05	
40	Plug	2	S64/2	S64/2	
41	Seal	2	UFP2303/5	UFP2303/5	
42	Seal	1	UFP2303/5	UFP2303/5	
43	Union, gauge connection, high pressure	1	56403	56403	

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Piston Primer Group – illustration



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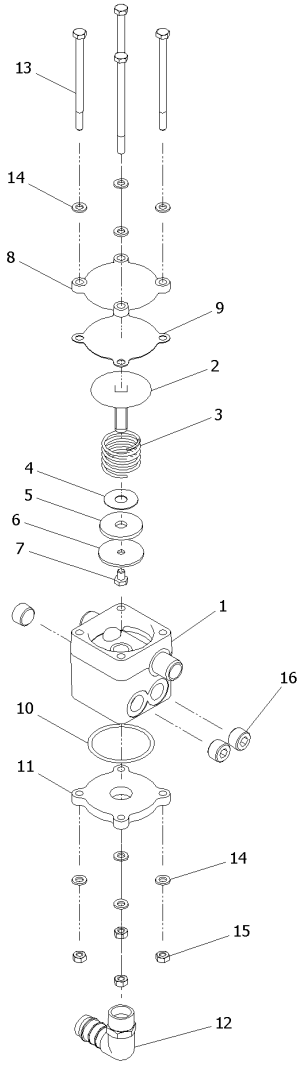
Piston Primer Group – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	Screw	2	65474	65474	
2	Valve inlet	2	65009	65009	
3	Valve outlet	2	65008/002	65008/002	
4	Cover	2	65011/100	65011/100	
5	Washer	8	MS27/4	MS27/4	
6	Bolt, cover to bearing housing	8	MS17/70	MS17/70	
7	Screw	2	65169	65169	
8	Bonded seal	2	MS133/8	MS133/8	
9	Piston	2	65006/004	65006/004	
10	O ring	2	65134	65134	
11	Water seal, piston	2	65119	65119	
12	O ring	2	61097	61097	
13	Cylinder liner	2	65005/002	65005/002	
14	Circlip	2	60914	60914	
15	Retaining disc	2	65167	65167	
16	O ring	2	65162	65162	
17	Shaft seal	2	65161	65161	
18	Wiper carrier	2	65158/001	65158/001	
19	O ring	2	52816	52816	
20	Shaft seal	2	65159	65159	
21	O ring	2	65160	65160	Supplied with item 20
22	DU Bearing	2	56949/007	56949/007	
23	O ring	2	61097	61097	
24	Cylinder	1	65139/102	65139/102	

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Priming Valve – illustration



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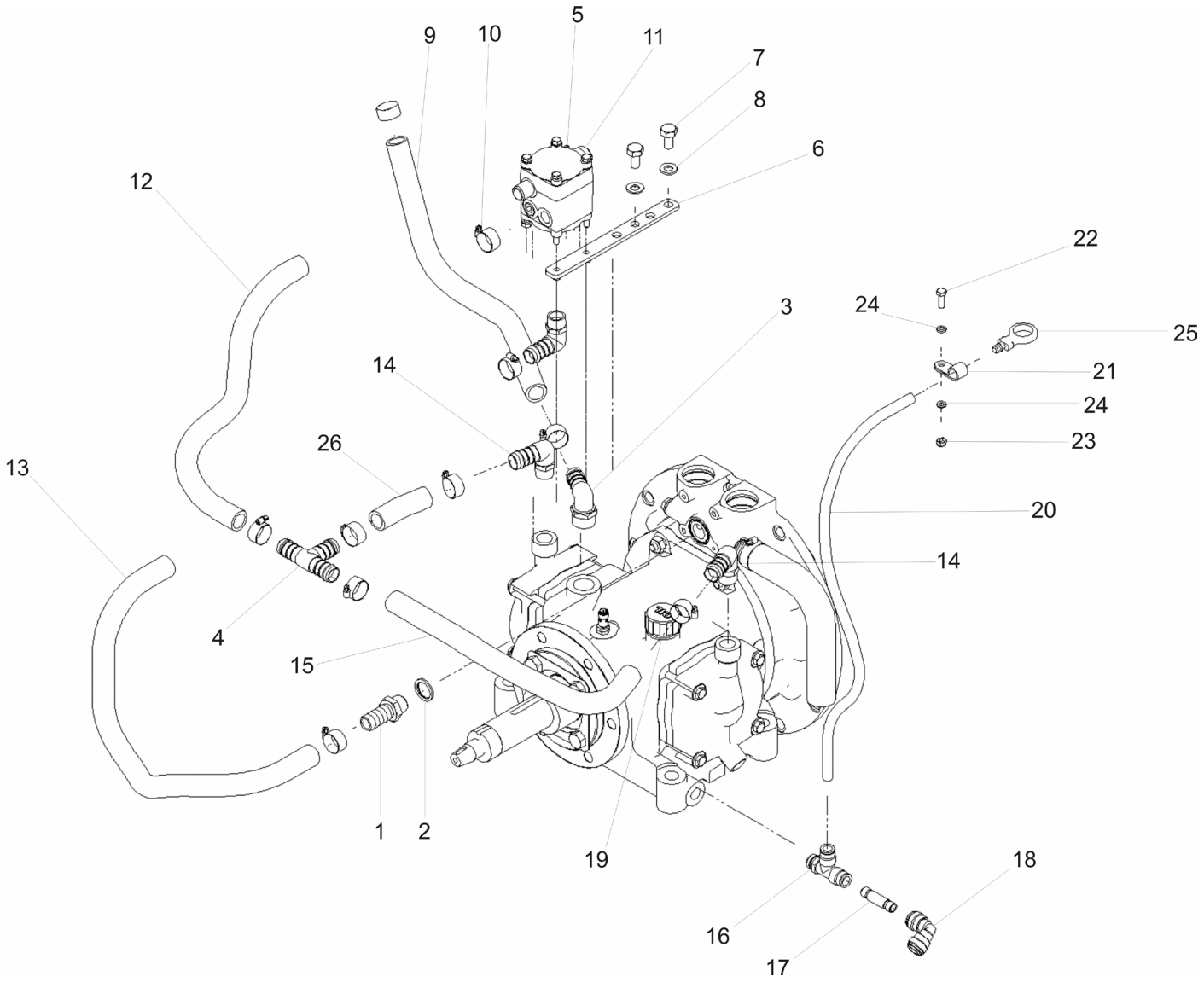
Priming Valve – list

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	BODY - PRIMING VALVE	1	65010/100	65010/100	All priming valves made in gunmetal
2	PISTON - PRIMING VALVE	1	65431/200	65431/200	
3	PRIMING VALVE SPRING	1	57555	57555	
4	SEAL RETAINING WASHER	1	55668	55668	
5	SEAL WASHER	1	55669	55669	
6	SEAL SUPPORT WASHER	1	55670	55670	
7	SCREW, SS HEX HEAD M6x8	1	MS104/8	MS104/8	
8	COVER - PRIMING VALVE	1	56120	56120	
9	DIAPHRAM - PRIMING VALVE	1	56123	56123	
10	O RING	1	53750	53750	
11	PLATE - PRIMING VALVE	1	65014/001	65014/001	
12	ELBOW - ¾"ID HOSE TO ½"BSPT	1	59392/002	59392/002	
13	BOLT, HEX HD M6x95	4	MS16/95	MS16/95	
14	WASHER, STD HEAVY M6	8	MS25/7	MS25/7	
15	NUT, FULL M6	4	MS41/4	MS41/4	
16	INT HEX HEAD PLUG 3/8" BSPT	3	60098/01	60098/01	

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Priming pipework – illustration



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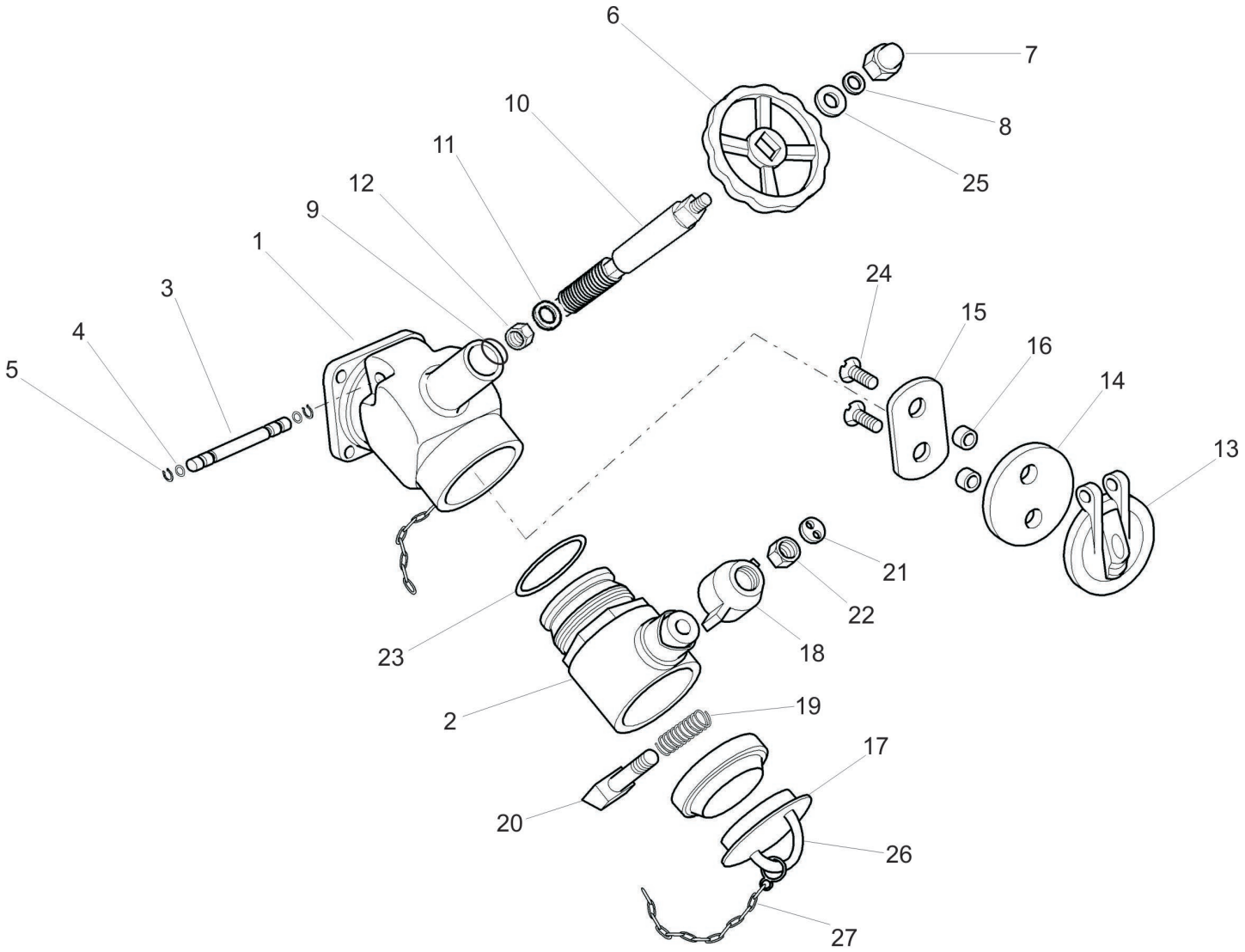
Priming pipework – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	Hose tail	1	60233/02	60233/02	
2	Seal, ½ “ BSP	1	UFP2303/8	UFP2303/8	
3	Elbow	1	59392/01	59392/01	
4	Tee hose connector	1	65505	65505	
5	Priming valve assembly	1	65140/101	65140/101	See pages 44-45 for details
6	Primer mounting plate	1	65499/001	65499/001	
7	Screw	2	MS06/20	MS06/20	
8	Washer	2	MS25/10	MS25/10	
9	Wire reinforced hose	.55m	65091MA	65091MA	
10	Hose clip	11	MS82/1	MS82/1	
11	Rubber foot	1	65707	65707	
12	Wire reinforced suction hose	.78m	65091MA	65091MA	
13	Hose	.66m	54737MA	54737MA	
14	Elbow	1	59392/002	59392/002	
15	Wire reinforced suction hose	.36m	65091MA	65091MA	
16	Tee piece	1	65506	65506	
17	Pipe piece	1	65504	65504	
18	Elbow	1	65446	65446	
19	Breather plug	1	60626	60626	
20	Nylon tubing	.505m	56221MA		
21	Clip	1	53708/03	53708/03	
22	Screw	1	MS04/20	MS04/20	
23	Nut	1	MS41/4	MS41/4	
24	Washer	1	MS25/7	MS25/7	
25	Dipstick	1	61131	61131	
26	Wire reinforced suction hose		65091MA	65091MA	

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Delivery Valve – Standard UK – illustration



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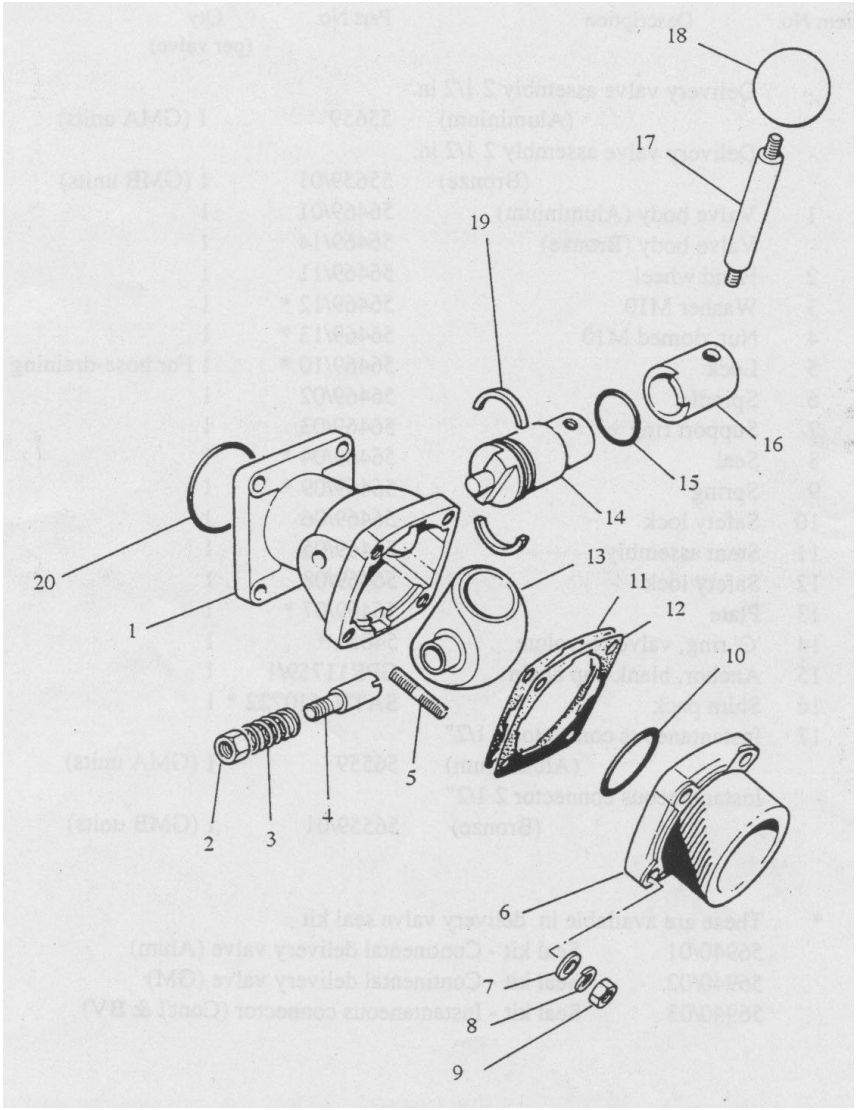
Delivery Valve – Standard UK - List

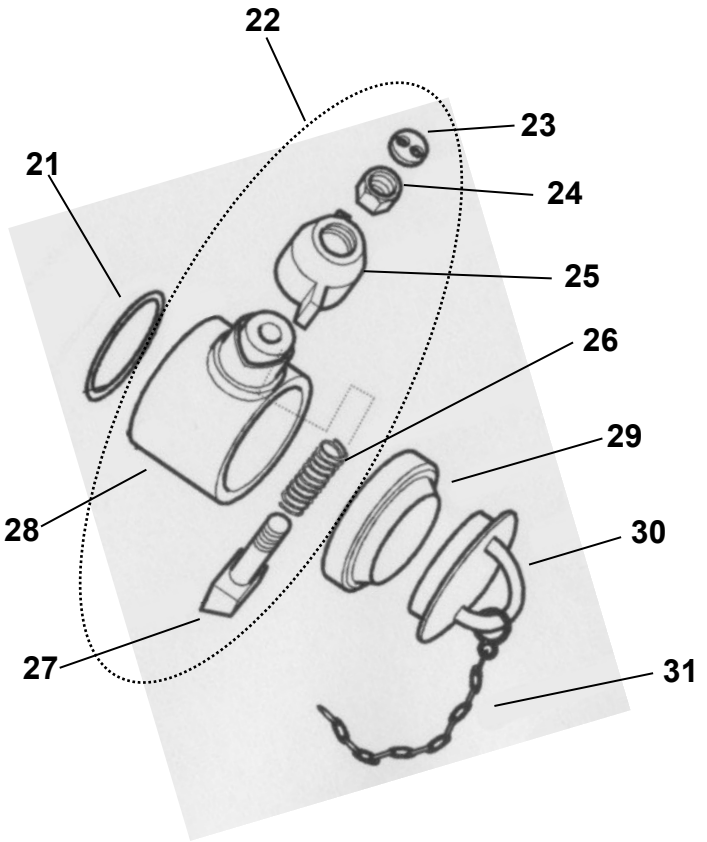
ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
	Complete assembly	-	56544/01	56545/01	
1	Main Body	N/A	N/A	N/A	
2	2.5” I/C Body	1	56979/28	56979/23	
3	Pivot Pin	1	56979/03	56979/03	
4	‘O’ Ring	2	56979/02	56979/02	
5	Circlip	2	56979/01	56979/01	
6	Screw Down Handle	1	56979/22	56979/22	
7	Domed Nut	1	56979/09	56979/09	
8	Spring Washer	1	56979/08	56979/08	
9	‘O’ Ring	1	56979/10	56979/10	
10	Screw Down Spindle	1	56979/16	56979/16	
11	Washer	1	56979/30	56979/30	
12	Nyloc nut	1	56979/29	56979/29	
13	Non Return Flap	1	56979/18	56979/19	
14	Non Return Flap Washer	1	56979/07	56979/07	
15	Retaining Washer	1	56979/06	56979/20	
16	Washer Insert	2	56979/05	56979/05	
17	Instantaneous Seal	1	FWP1003/A	FWP1003/A	
18	Twist Release Knob	1	56979/26	56979/27	
19	Release Spring	1	56979/14	56979/14	
20	Release Plunger	1	56979/13	56979/21	
21	Knob Closure bung	1	56979/31	56979/25	
22	Nyloc Nut	1	56979/32	MS141/5	
23	‘O’ Ring	1	56979/15	56979/15	
24	Countersunk Screw	2	56979/04	56979/04	
25	Plain Washer	1	MS125/9	MS125/9	
26	Blank cap	1	2415	2415	
27	Chain	1	TH4749	TH4749	

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Delivery Valve – Ball Valve – illustration





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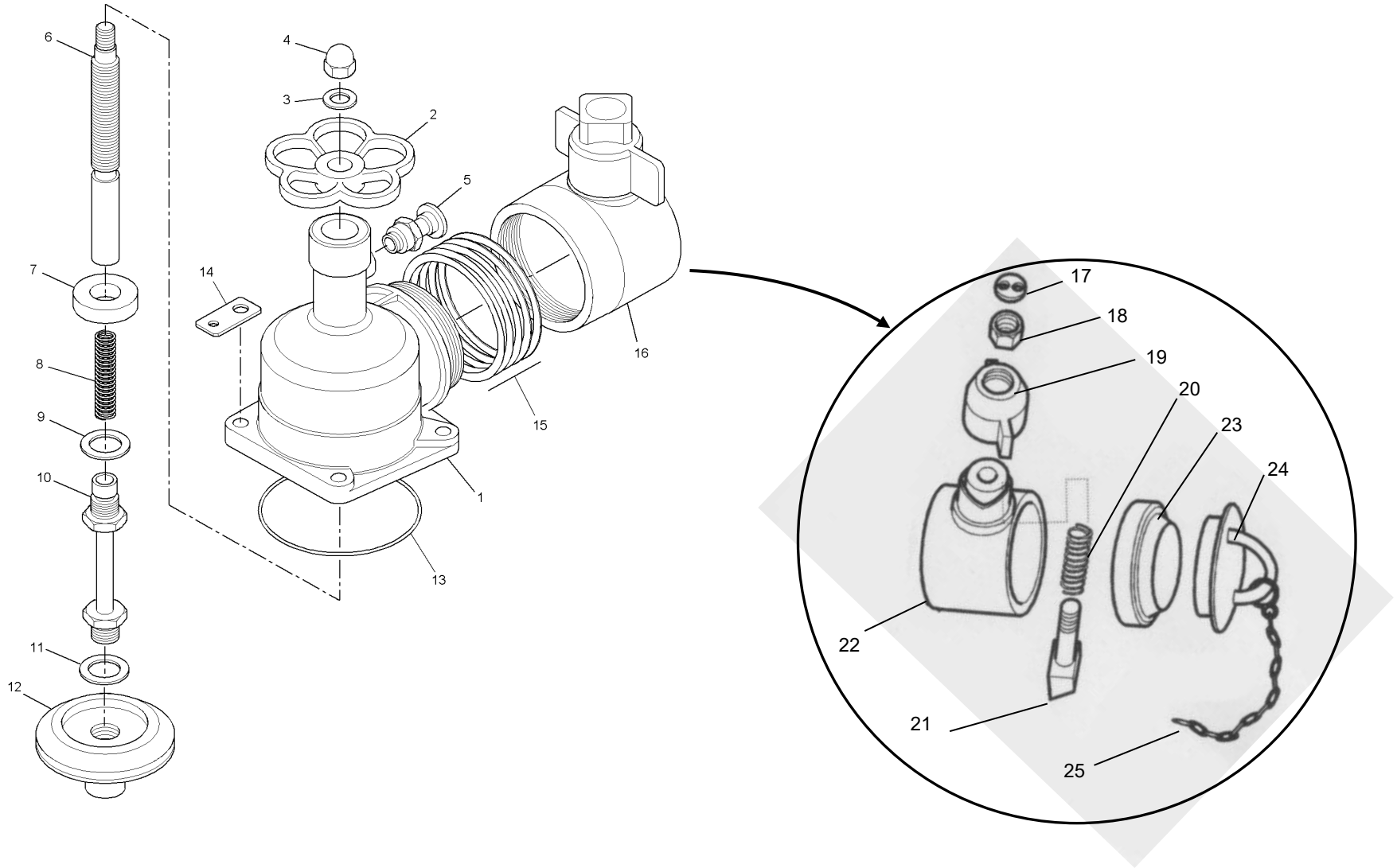
Delivery Valve – Ball Valve - List

Item Number	Description		No. per Valve	Light Alloy All models	Gunmetal All models
	Ball valve, LH, 2.5” instantaneous connector, complete valve			TH137	TH153/100
	Ball valve, RH, 2.5” instantaneous connector, complete valve			TH138	TH154/100
1	Body, delivery valve, LH		1	TH4200/A	TH4200/B
-	Body, delivery valve, RH		1	TH4201/A	TH4201/B
2	Nut, 5/16in UNF		1	S214/4	S214/4
3	Spring, ball valve	Kit part 1	1	TH11205	TH11205
4	Pivot ball		1	TH11194	TH11194
5	Stud, 3/8in., valve cap to body		4	S165/8	S165/8
6	Valve cap		1	TH3331/1A	TH3331/1B
7	Washer 3/8in.		4	S21/5	S21/5
8	Spring washer 3/8in.		4	S20/5	S20/5
9	Nut 3/8in UNF		4	S214/5	S214/5
10	O ring, valve seating	Kit part 1	1	THG3419	THG3419
11	Gasket, 0.010in. thick	Kit part 1	1	TH11197	TH11197
12	Gasket, 0.003in. thick	Kit part 1	1	TH11197/1	TH11197/1
13	Ball valve		1	TH2258	TH2255
14	Valve stem		1	THG3469/1	THG3469/1
15	O ring, valve stem	Kit part 1	1	THG4086	THG4086
16	Handle boss, LH		1	TH5372/3A	TH5372/3B
-	Handle boss, RH		1	TH5372/1A	TH5372/1B
17	Handle		1	TH5370/2	TH5370/2
18	Knob, handle		1	TH1835/1A	TH1835/1A
19	Collar, valve to stem (pair of half collars)	Kit part 1	1	TH11190	TH11190
20	O ring, body to delivery manifold	Kit part 1	1	TH1511/A	TH1511/A
21	Shim pack		1	SATHM10722	SATHM10722
22	Instantaneous connector, complete assembly, includes items 22-29		1	56559	56559/01
23	Knob closure disc		1	56979/24	56979/25
24	Nyloc nut		1	56979/11	MS141/5
25	Twist release knob	kit part 2	1	56979/26	56979/27
26	Release spring	kit part 2	1	56979/14	56979/14
27	Release plunger		1	56979/13	56979/21
28	2.5in Instantaneous connector body		1	56979/28	56979/23
29	Seal	kit part 2	1	FWP1003/A	FWP1003/A
30	Blank cap, rubber		1	2415	2415
31	Chain, 9in long		1	TH4749	TH4749
	Items 30, 31 supplied as Blank cap assembly		1	THL119/6	TH119/6
	Kit part 1 = Part also supplied in Seal kit for valve body		1	56940/05	56940/05
	Kit part 2 = Part also supplied in Seal kit for Instant. connector		1	56940/03	56940/03

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Delivery Valve – Continental Type – Instant. Connector - Illustration



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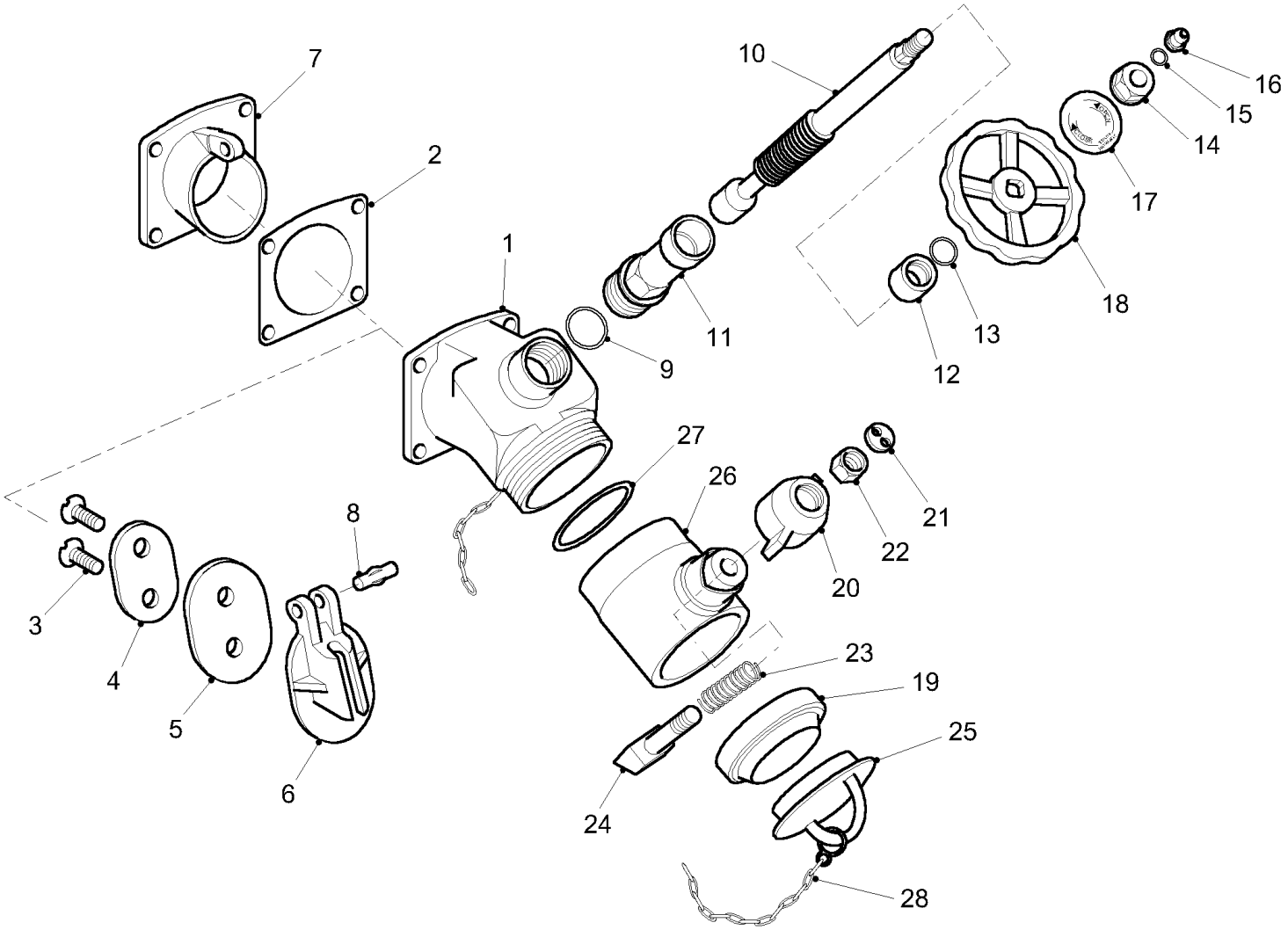
Delivery Valve – Continental Type – Instant. Connector – List

Item Number	Description	No. per Valve	Light Alloy All models	Gunmetal All models
	Continental type valve, 2.5in instantaneous connector, complete valve		55662	55920
1	Valve body	1	56469/01	56469/14
2	Hand wheel	1	56469/11	56469/11
3	Washer M10	1	56469/12	56469/12
4	Nut, domed M10	1	56469/13	56469/13
5	Lock Kit part 1	1	56469/10	56469/10
6	Spindle	1	56469/02	56469/02
7	Spindle sleeve, c/w seals Kit part 1	1	56469/03	56469/16
8	Spring Kit part 1	1	56469/09	56469/09
9	Safety lock	1	56469/06	56469/06
10	Stem assembly	1	56469/05	56469/05
11	Safety lock Kit part 1	1	56469/08	56469/08
12	Plate Kit part 1	1	56469/07	56469/15
13	O ring Kit part 1	1	61142	61142
14	Anchor, blank cap chain Only fitted for Storz type connectors	1	GPR11759	GPR11759
15	Shim pack Kit part 2	1	SATHM10722	SATHM10722
16	Instantaneous connector, complete assembly	1	56559	56559/01
17	Knob closure disc	1	56979/24	56979/25
18	Nyloc nut	1	56979/11	MS141/5
19	Twist release knob	1	56979/26	56879/27
20	Release spring Kit part 2	1	56979/14	56979/14
21	Release plunger Kit part 2	1	56979/13	56979/21
22	2.5in Instantaneous connector body	1	56979/28	56979/23
23	Seal Kit part 2	1	FWP1003/A	FWP1003/A
24	Blank cap, rubber	1	2415	2415
25	Chain, 9in long	1	TH4749	TH4749
	Items 30, 31 supplied as Blank cap assembly	1	THL119/6	TH119/6
	Kit part 1 = Part also supplied in seal kit for valve body	1	56940/01	56940/02
	Kit part 2 = Part also supplied in seal kit for instant. connector	1	56940/03	56940/03

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Delivery Valve – Dual Flow – Instant. Connector – Illustration



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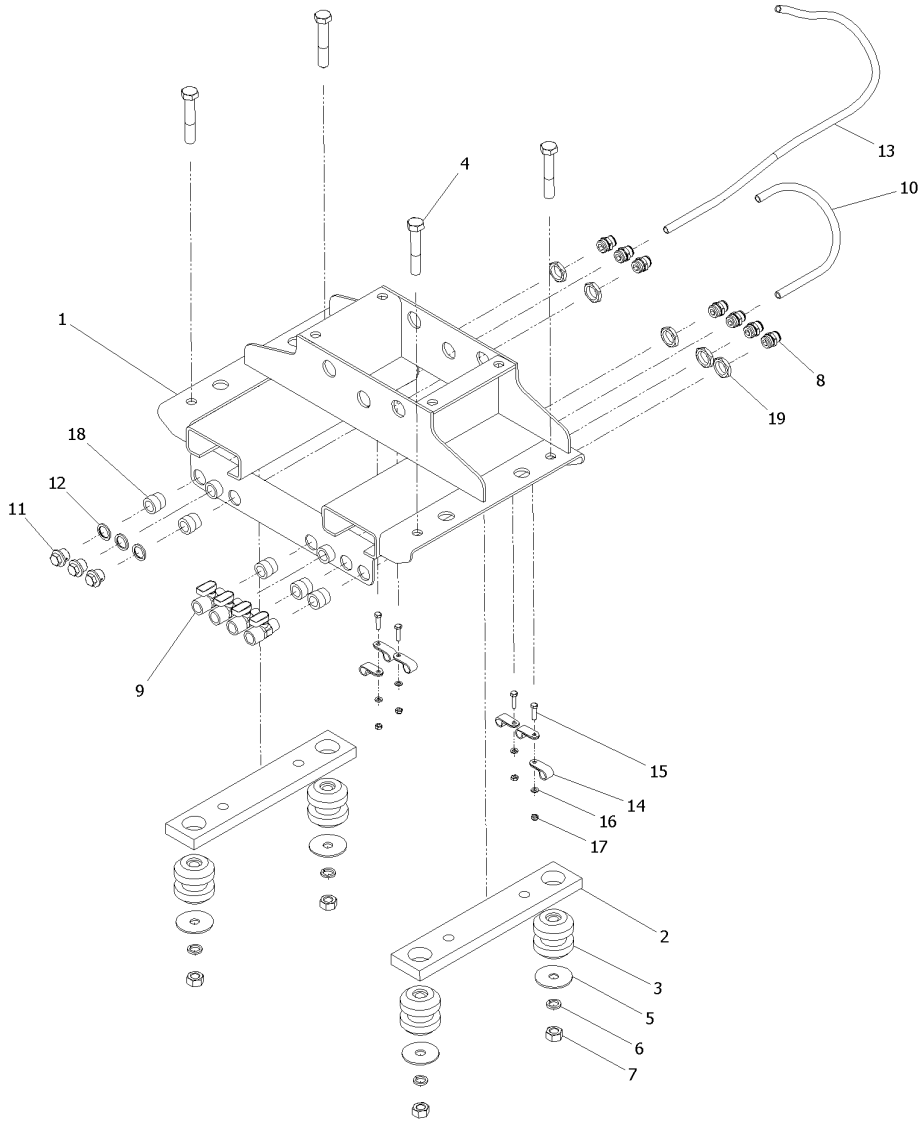
Delivery Valve – Dual Flow – Instantaneous Connector – List

Item	Description	Part No. Allloy	Part No. Gunmetal	Qty
1	Valve body	THM10721/A	THM10721/B	1
2	Joint washer	TH2772	TH2772	1
3	Screws, countersunk	MS172/61	MS172/61	2
4	Plate	THM10580	THM10580	1
5	Sealing washer	THM10453	THM10453	1
6	Valve flap	THM10578	THM10578/B	1
7	Valve seat	THM10726/A	THM10726/B	1
8	Hinge pin	TH2748	TH2748	1
9	Dowty seal	UFP2303/11	UFP2303/11	1
10	Valve rod	THM10451/1	THM10451/1	1
11	Valve stem	FWP1000/1	THM10717/B	1
12	Bush	THM10718	THM10718	1
13	O ring	FWP8217	FWP8217	1
14	Lock nut, seal	THM10528/1	THM10528/1	1
15	Sealing washer	THM10597	THM10597	1
16	Grease nipple	THM10596	THM10596	1
17	Instruction plate	THM10600/A	THM10600/A	1
18	Handwheel	FWP2009	FWP2009	1
19	Instantaneous seal	FWP1003/A	FWP1003/A	1
20	Twist release knob	56979/26	56979/26	1
21	Closure disc	56979/24	56979/24	1
22	Nyloc nut	56979/11	56979/11	1
23	Release spring	56979/14	56979/14	1
24	Release plunger	56979/13	56979/13	1
25	Blank cap	2415	2415	1
26	2.5” Instantaneous connector body	56979/28	56979/28	1
27	Shim pack, contains items listed below -	SATHM10722	SATHM10722	1
-	Shim .002” thick polyester	THM10722	THM10722	1
-	Shim .005” thick polyester	THM10722/1	THM10722/1	1
-	Shim .010” thick polyester	THM10722/2	THM10722/2	1
-	Shim .030” thick polyester	THM10722/3	THM10722/3	1
-	Shim .060” thick polyester	THM10722/4	THM10722/4	1
28	Chain, blank cap to valve	TH4749	TH4749	1

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Mounting Platform Group – illustration



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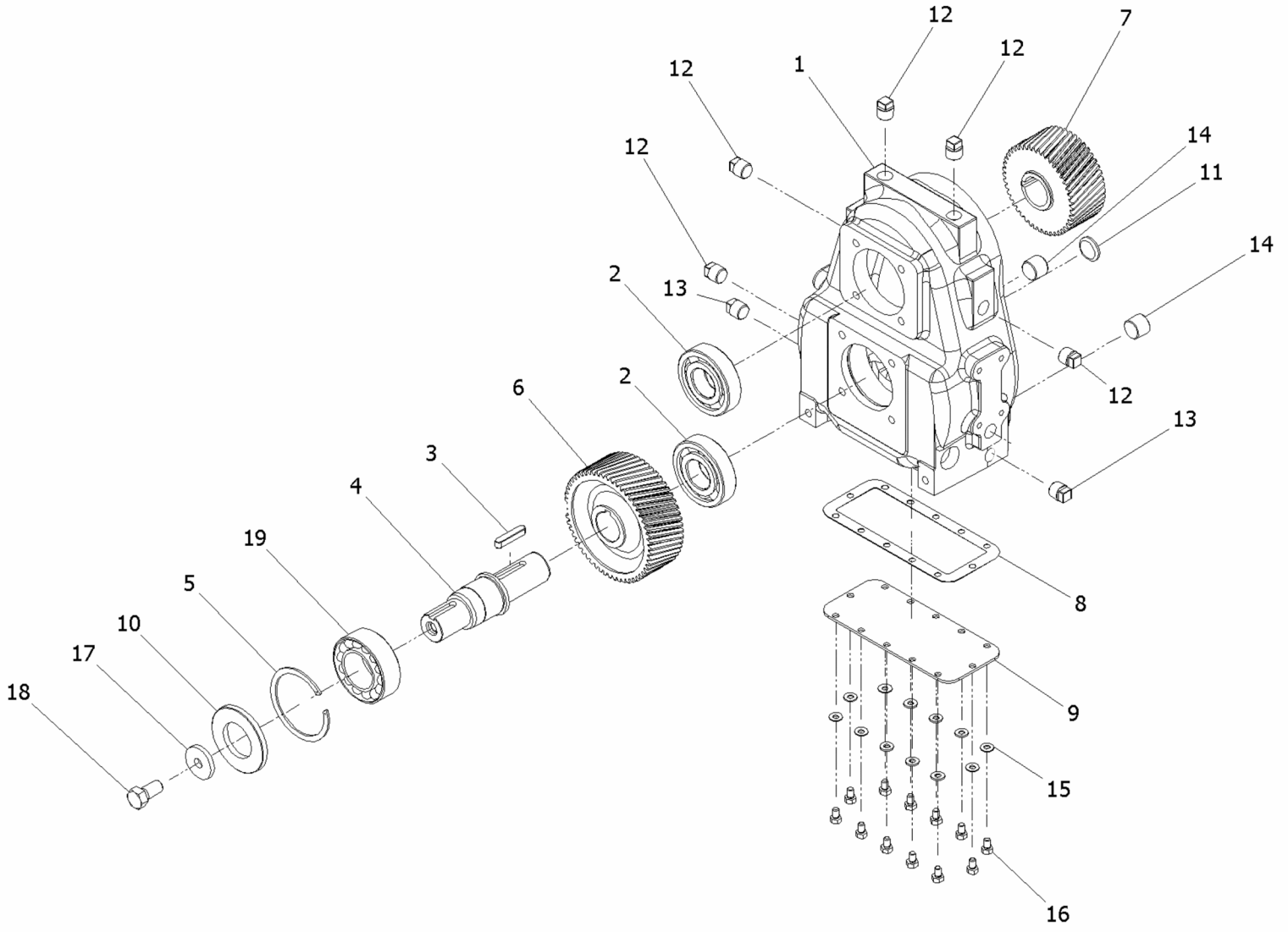
Mounting Platform Group – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	CAFS PUMP SUPPORT MOUNTING BASE	1	65212/002	65212/002	
2	MOUNT PLATE	2	60641	60641	
3	FLEXIBLE MOUNT	4	60642	60642	
4	BOLT, HEX HEAD M16x90	4	MS20/90	MS20/90	
5	SPECIAL WASHER RUBBERMOUNT	4	60365	60365	
6	WASHER, SPRING SQ M16	4	MS29/10	MS29/10	
7	NUT, FULL M16	4	MS35/12	MS35/12	
8	STRAIGHT ADAPTOR PUSH IN 12-½"	7	59082/09	59082/09	
9	BALL VALVE ½" BSPT x ½" BSPP	4	65214/001	65214/001	
10	NYLON TUBING (BLACK)	.37m	56221MA	56221MA	
11	OIL DRAIN PLUG	3	65599	65599	
12	BONDED SEAL ½"BSP SELF CENT	3	UFP2303/8	UFP2303/8	
13	NYLON TUBING (BLACK)	.675m	56221MA	56221MA	
14	CLIP - CONDUIT	6	53708/03	53708/03	
15	SCREW, HEX HD M6x25LG	4	MS04/25	MS04/25	
16	WASHER, STD HEAVY M6	4	MS25/7	MS25/7	
17	NUT, NYLOC M6	4	MS41/4	MS41/4	
18	DRAIN SCREW BOSS	5	65126/002	65126/002	
19	BULKHEAD NUT	5	65703	65703	

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Gearbox Assembly - illustration



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Gearbox Assembly – List

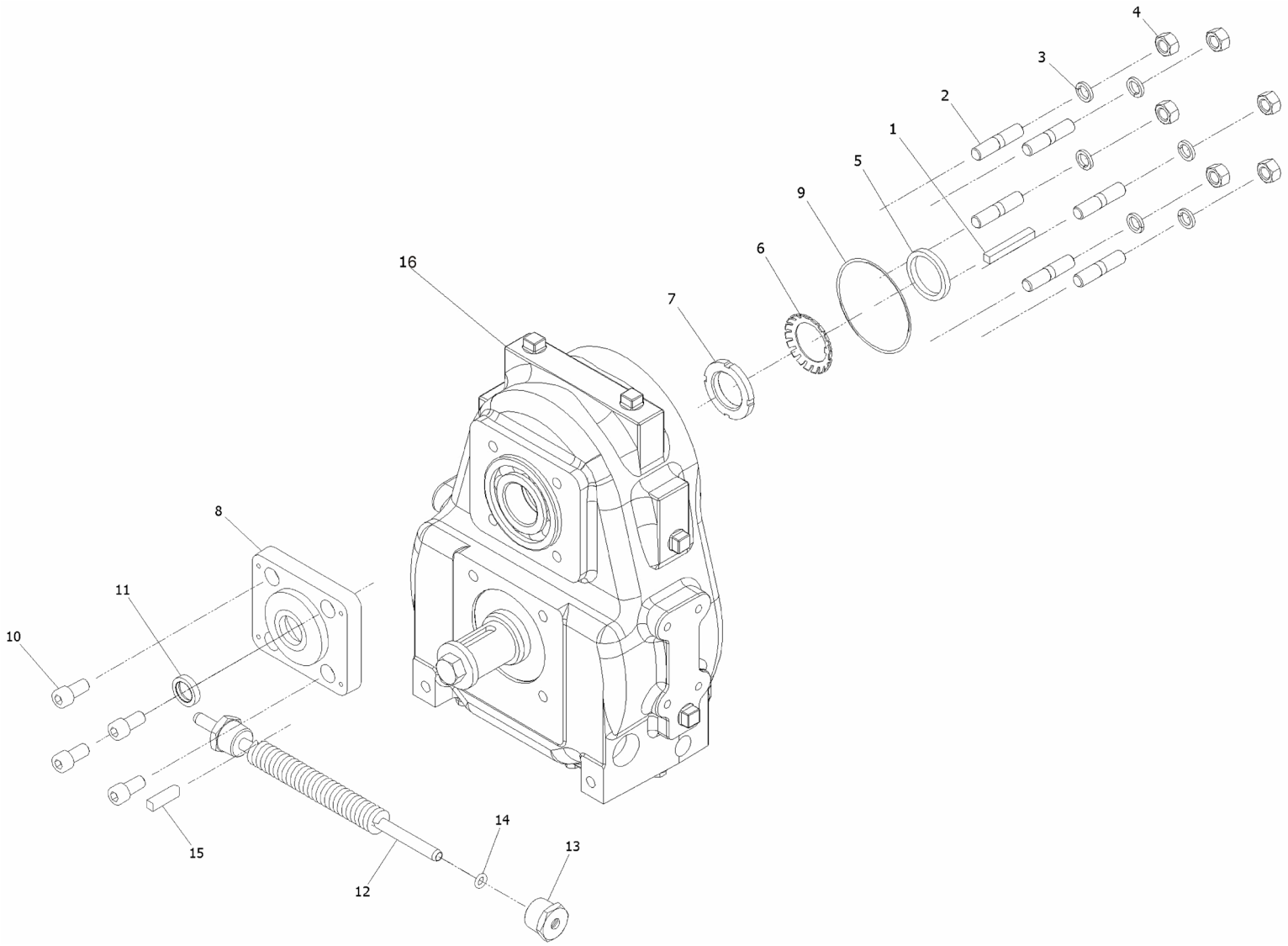
ITEM	DESCRIPTION	QTY	CAST IRON	NOTES
1	Gearbox casing	1	004-0581-00-0	All Godiva gearboxes are
2	Bearing (308J)	2	250-0308-32-0	Made of cast iron
3	Key	1	017-0300-00-0	
4	Drive shaft	1	037-2221-00-0	
5	Retaining ring	1	077-3540-00-0	
6	Drive gear	1	-	See table below for Drive
7	Pinion gear	1	-	and Pinion gear ratio options
8	Gasket	1	046-5270-01-0	
9	Cover	1	044-0840-00-0	
10	Oil seal	1	296-2810-00-0	
11	Knock out plug	1	217-3360-00-0	
12	Plug, ½ NPT	6	217-0401-00-0	
13	Plug, magnetic, ½ NPT	2	217-0401-08-0	
14	Plug, ¾ NPT	2	217-0501-03-0	
15	Washer, 5/16	12	097-0810-01-0	
16	Screw	12	018-1404-25-0	
17	Washer	1	097-0890-03-0	
18	Screw	1	018-2412-25-0	
19	Bearing	1	250-5210-20-0	

	Item 6. Drive Gear	Item 7. Pinion Gear	Ratio	Complete gearbox assembly
	031-1510-00-0 (56T)	031-1520-00-0 (45T)	1.24	504-0640-12-0
	031-1500-00-0 (59T)	031-5160-00-0 (42T)	1.40	504-0640-14-0
	031-1490-00-0 (62T)	031-5180-00-0 (39T)	1.59	504-0640-16-0
	031-1480-00-0 (65T)	031-5200-00-0 (36T)	1.80	504-0640-18-0
	031-1470-00-0 (67T)	031-1440-00-0 (34T)	1.97	504-0640-20-0
	031-1610-00-0 (69T)	031-5220-00-0 (32T)	2.16	504-0640-22-0
	031-1460-00-0 (71T)	031-5240-00-0 (30T)	2.37	504-0640-24-0

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Gearbox Fittings - illustration



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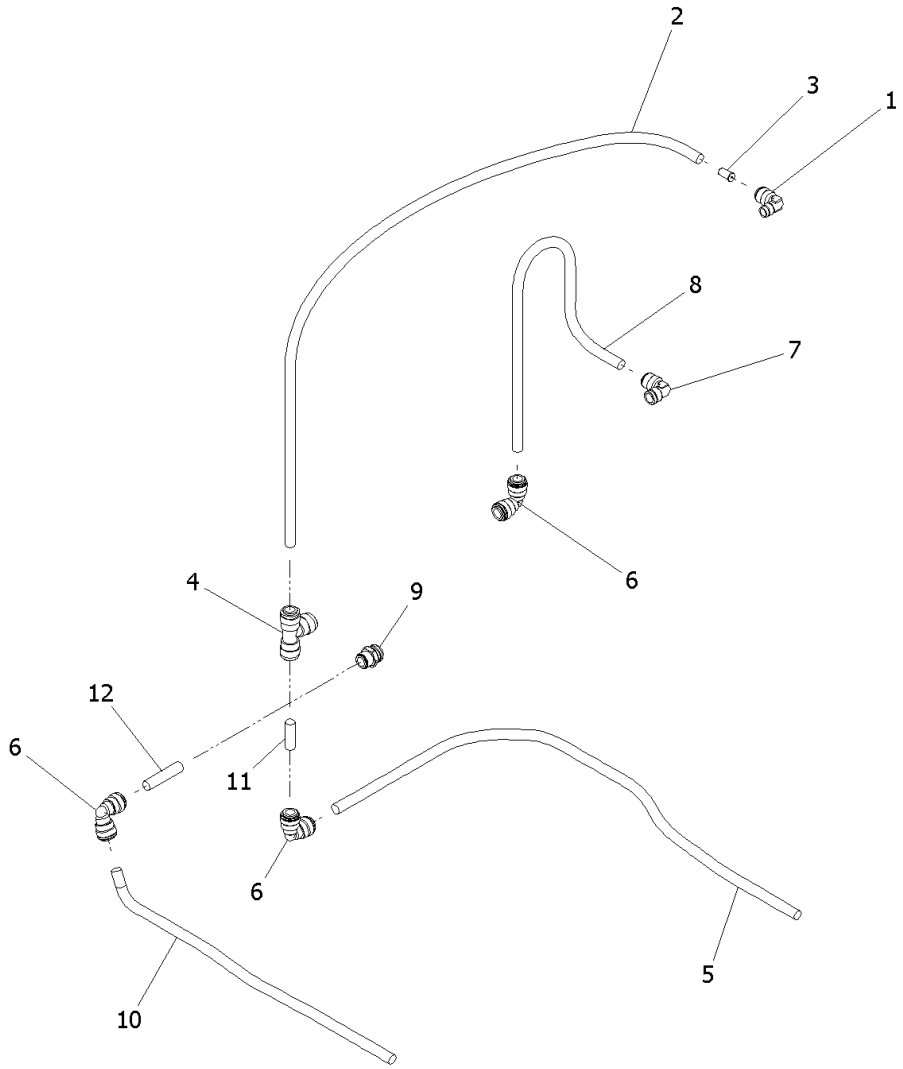
Gearbox Fittings – List

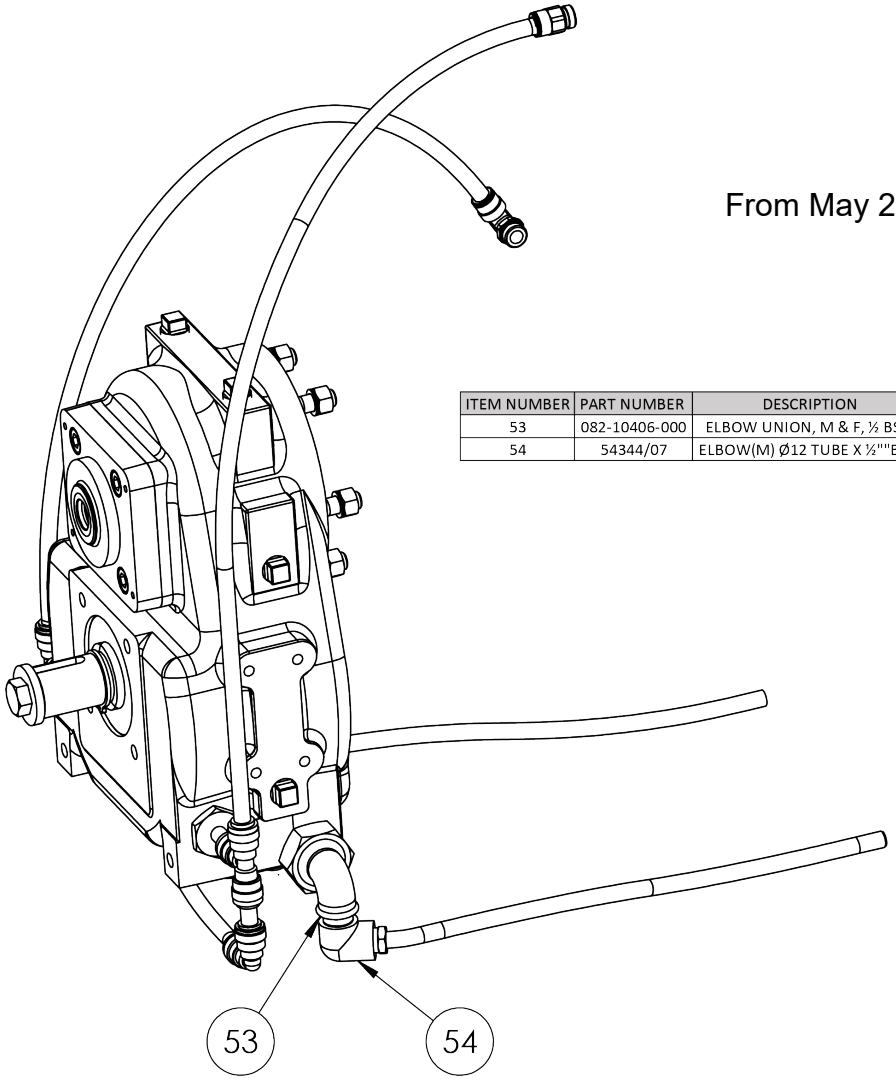
ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	PINION KEY	1	017-5030-50-0	017-5030-50-0	
2	STUD ½" UN	6	S167/10	S167/10	
3	SPRING WASHER ½" BORE SQ SC	6	S20/7	S20/7	
4	NUT H.T. ½" UNF	6	S263/7	S263/7	
5	SPACER	1	60356	60356	
6	LOCKING WASHER - DIA 40	1	60048	60048	
7	LOCK NUT - M40 X 1½	1	60049	60049	
8	COVER-SHAFT END	1	60352	60352	
9	O-RING 90 I/D x 2 SECT	1	60357	60357	
10	SCREW SKT HD ½" UNC x 1" U/H	4	S227/H8	S227/H8	
11	OIL SEAL	1	60332	60332	
12	COOLING PIPE	1	60474/002	60474/002	
13	SEAL PLUG	1	65417	65417	
14	O-RING I/D 11.6 X 2.4	1	FWP8217	FWP8217	
15	KEY DRIVE COUPLING	1	017-0300-02-0	017-0300-02-0	
16	GEARBOX ASSEMBLY	1	-	-	See table on page 57
					for various ratios available

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Gearbox Pipework (gearbox in down position) - illustration





From May 2022

ITEM NUMBER	PART NUMBER	DESCRIPTION	QUANTITY
53	082-10406-000	ELBOW UNION, M & F, ½ BSPT	1
54	54344/07	ELBOW(M) Ø12 TUBE X ½""BSPT	1

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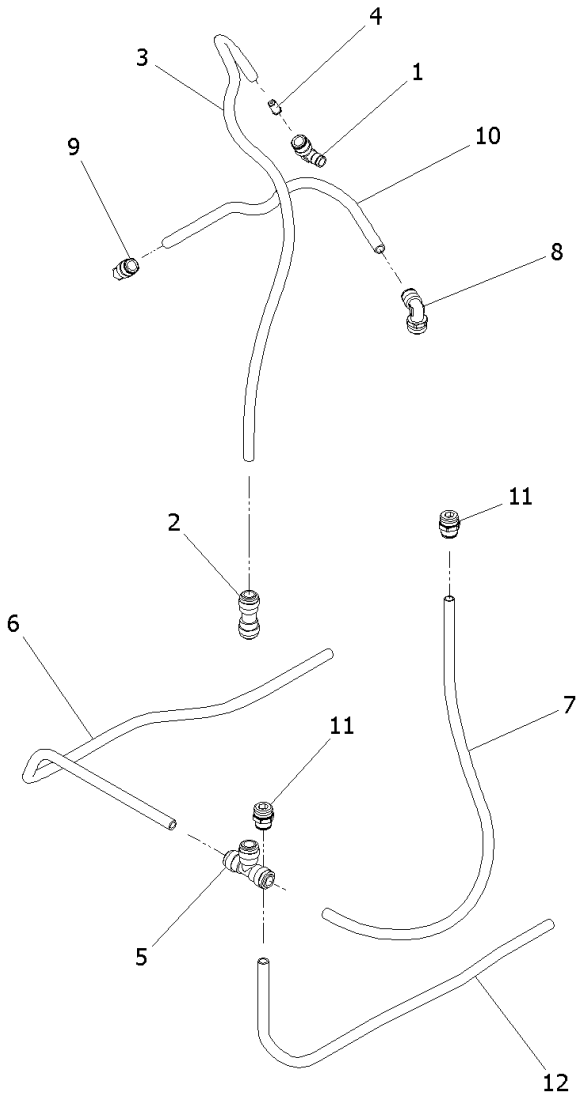
Gearbox Pipework (gearbox in down position) – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	ELBOW CONNECTOR 12 DIA ¼"	1	59083/03	59083/03	
2	NYLON TUBING (BLACK)	.85m	56221MA	56221MA	
3	RESTRICTOR - COOLING PIPE	1	65444	65444	
4	EQUAL TEE	1	65445	65445	
5	NYLON TUBING (BLACK)	.7m	56221MA	56221MA	
6	EQUAL ELBOW 12 DIA	3	65446	65446	
7	ELBOW CONNECTOR 12 D 3/8"	1	59083/02	59083/02	
8	NYLON TUBING (BLACK)	.78m	56221MA	56221MA	
9	STRAIGHT ADAPTOR PUSH IN 12-½"	1	59082/09	59082/09	
10	NYLON TUBING (BLACK)	.46m	56221MA	56221MA	
11	NYLON TUBING (BLACK)	.04m	56221MA	56221MA	
12	NYLON TUBING (BLACK)	.05m	56221MA	56221MA	

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Gearbox Pipework (gearbox in left position) - illustration



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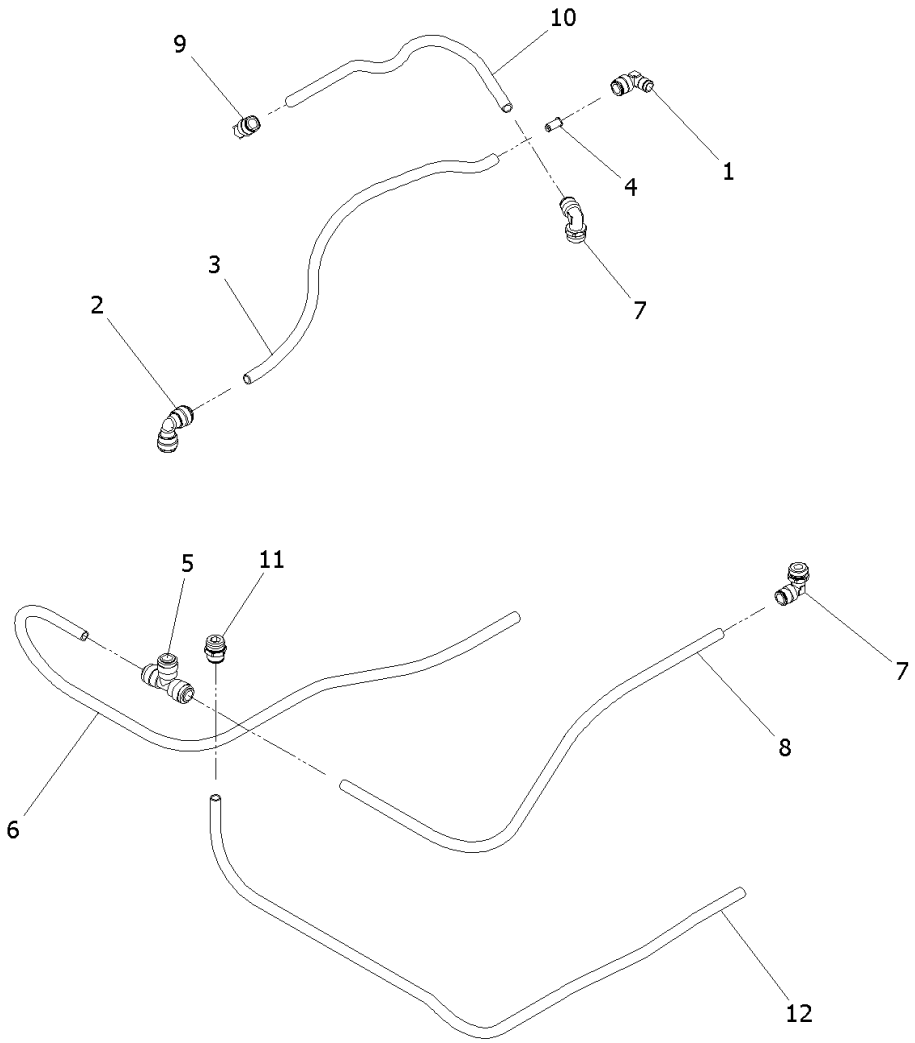
Gearbox Pipework (gearbox in left position) – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	ELBOW CONNECTOR 12 DIA ¼"	1	59083/03	59083/03	
2	EQUAL STRAIGHT CONNECTOR	1	65495	65495	
3	NYLON TUBING (BLACK)	.8m	56221MA	56221MA	
4	RESTRICTOR - COOLING PIPE	1	65444	65444	
5	EQUAL TEE	1	65445	65445	
6	NYLON TUBING (BLACK)	.85m	56221MA	56221MA	
7	NYLON TUBING (BLACK)	.7m	56221MA	56221MA	
8	ELBOW G½" TO Ø12 HOSE	1	59189	59189	
9	ELBOW CONNECTOR 12 D 3/8"	1	59083/02	59083/02	
10	NYLON TUBING (BLACK)	.5m	56221MA	56221MA	
11	STRAIGHT ADAPTOR PUSH IN 12-½"	2	59082/09	59082/09	
12	NYLON TUBING (BLACK)	.59m	56221MA	56221MA	

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Gearbox Pipework (gearbox in right position) - illustration



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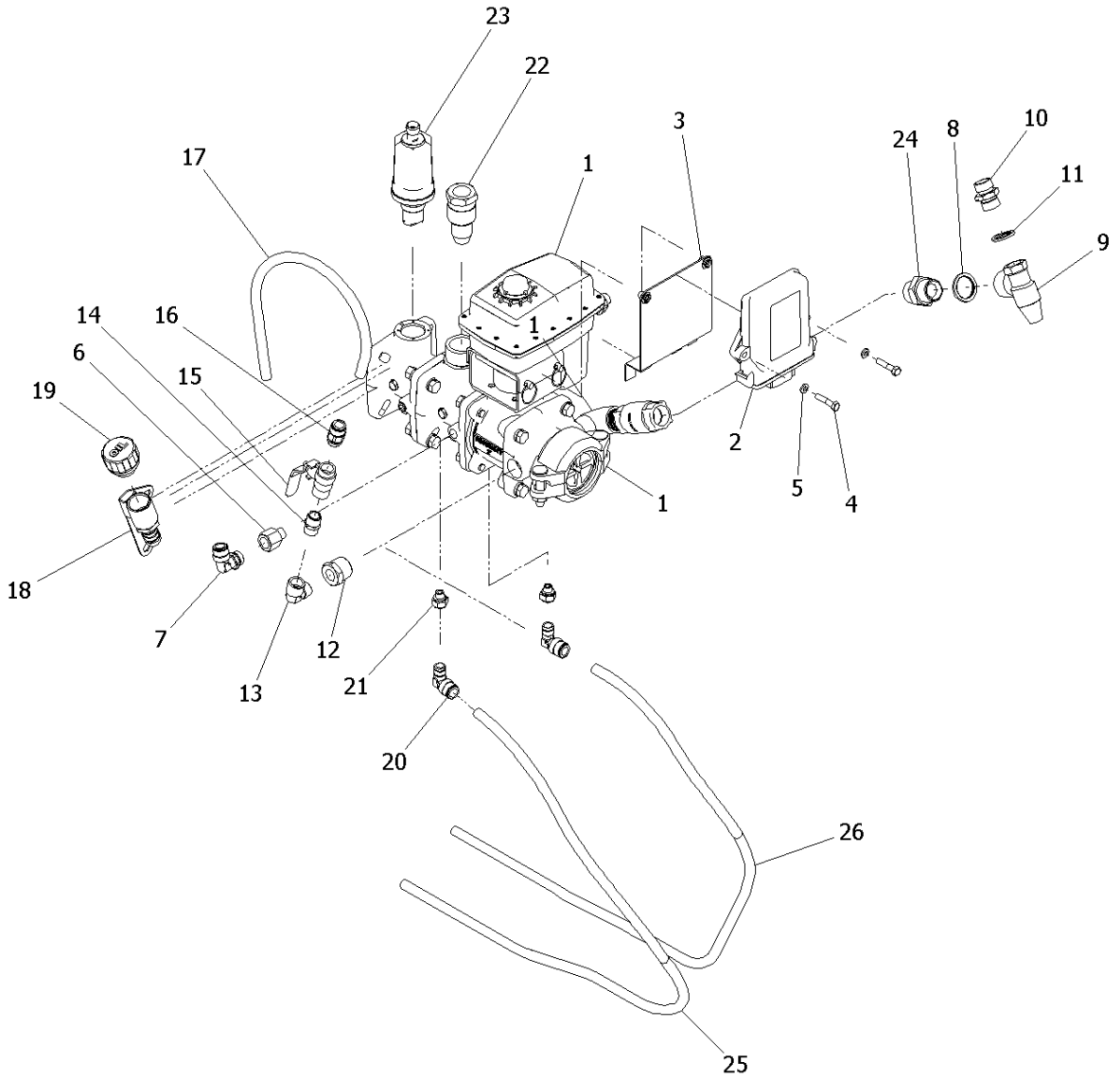
Gearbox Pipework (gearbox in right position) – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	ELBOW CONNECTOR 12 DIA ¼"	1	59083/03		
2	EQUAL ELBOW 12 DIA	1	65446		
3	NYLON TUBING (BLACK)	.525m	56221MA		
4	RESTRICTOR - COOLING PIPE	1	65444		
5	EQUAL TEE	1	65445		
6	NYLON TUBING (BLACK)	1m	56221MA		
7	ELBOW G½" TO Ø12 HOSE	2	59189		
8	NYLON TUBING (BLACK)	.88m	56221MA		
9	ELBOW CONNECTOR 12 D 3/8"	1	59083/02		
10	NYLON TUBING (BLACK)	.5m	56221MA		
11	STRAIGHT ADAPTOR PUSH IN 12-½"	1	59082/09		
12	NYLON TUBING (BLACK)	1m	56221MA		

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SmartCAFS50 Manifold Assembly - illustration



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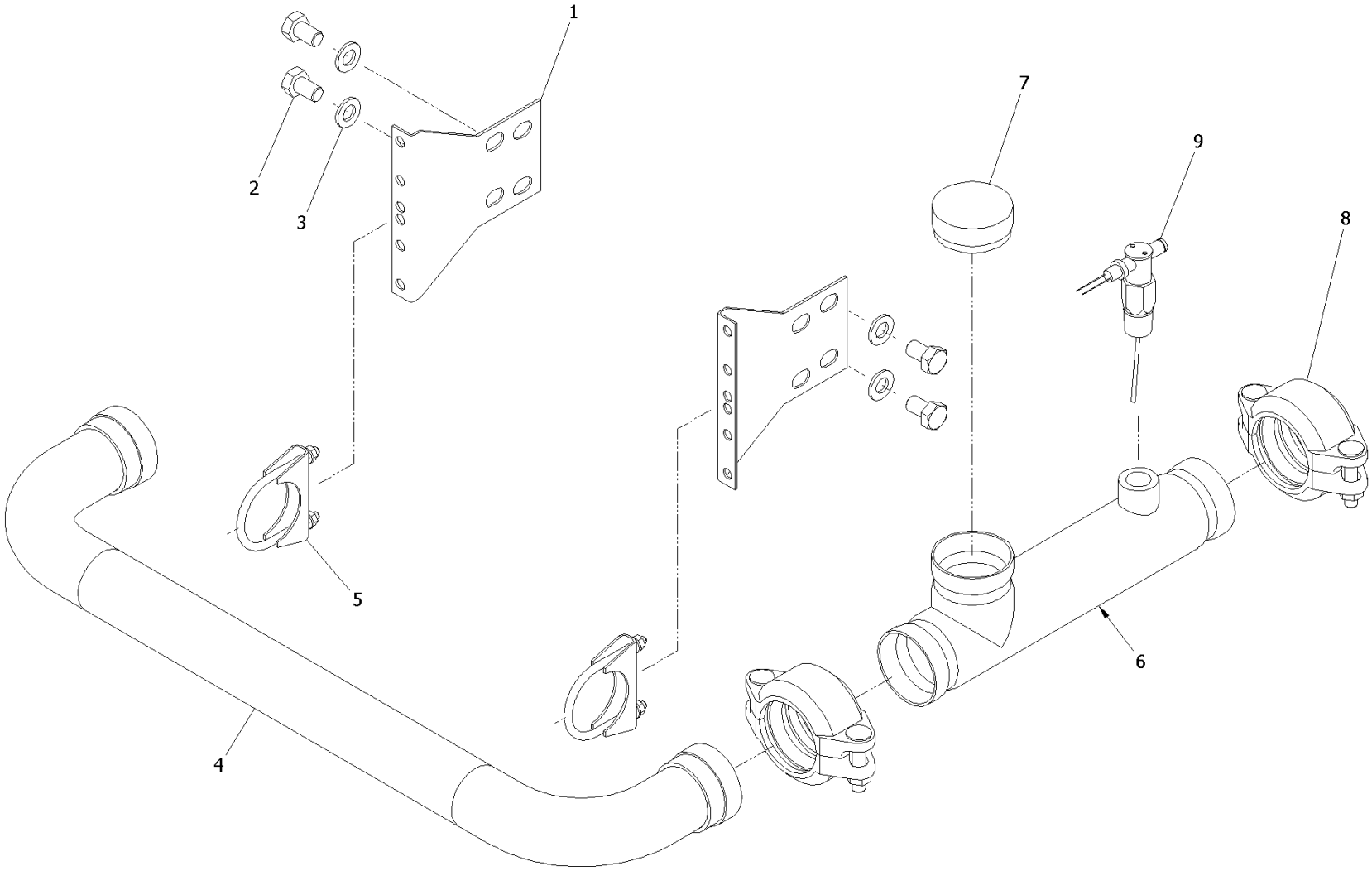
SmartCAFS50 Manifold Assembly – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	MANIFOLD ASSY. SMART CAFS 2.0"	1	C1-115267	C1-115267	
2	INTERLOCK MODULE	1	C1-114631	C1-114631	
3	INTERLOCK CONTROL	1	65114	65114	
4	BOLT, HEX HD M6x30	2	M16/30	M16/30	
5	WASHER, STD HEAVY M6	2	MS25/7	MS25/7	
6	RESTRICTOR ADAPTOR	1	65563/001	65563/001	
7	SWIVEL ELBOW CONN 12-3/8"	1	59189/02	59189/02	
8	BONDED SEAL ¾" BSP	1	UFP2303/10	UFP2303/10	
9	PRESSURE SAFETY VALVE 4 BAR	1	61111/002	61111/002	
10	60° MALE ADAPTOR	1	65580	65580	
11	BONDED SEAL ½"BSP SELF CENT	1	UFP2303/8	UFP2303/8	
12	REDUCING BUSH	1	65564	65564	
13	EQUAL ELBOW	1	60752/02	60752/02	
14	MALE ADAPTOR EQUAL	1	59086/002	59086/002	
15	BALL VALVE 3/8" BSP	1	65529	65529	
16	STRAIGHT ADAPTOR PUSH IN 12-3/8	1	59082/02	59082/02	
17	NYLON TUBING DIA 12	1	56221MA	56221MA	
18	OIL FILL ADAPTOR	1	65518/001	65518/001	
19	BREATHER PLUG+SPLASH GUARD	1	60626	60626	
20	ELBOW CONNECTOR 12 DIA ¼"	2	59083/03	59083/03	
21	INCREASING ADAPTOR 1/8 TO 1/4	2	65598	65598	
22	INJECTOR CHECK VALVE	1	038-1790-00-0	038-1790-00-0	
23	PADDLEWHEEL, MODEL 100	1	C1-102714	C1-102714	
24	MALE ADAPTOR ¾" BSP CONED x ¾" NPT	1	61293	61293	
25	NYLON TUBING (BLACK)	1	56221MA	56221MA	
26	NYLON TUBING (BLACK)	1	56221MA	56221MA	

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SmartCAFS50 Foampipe Assembly – illustration



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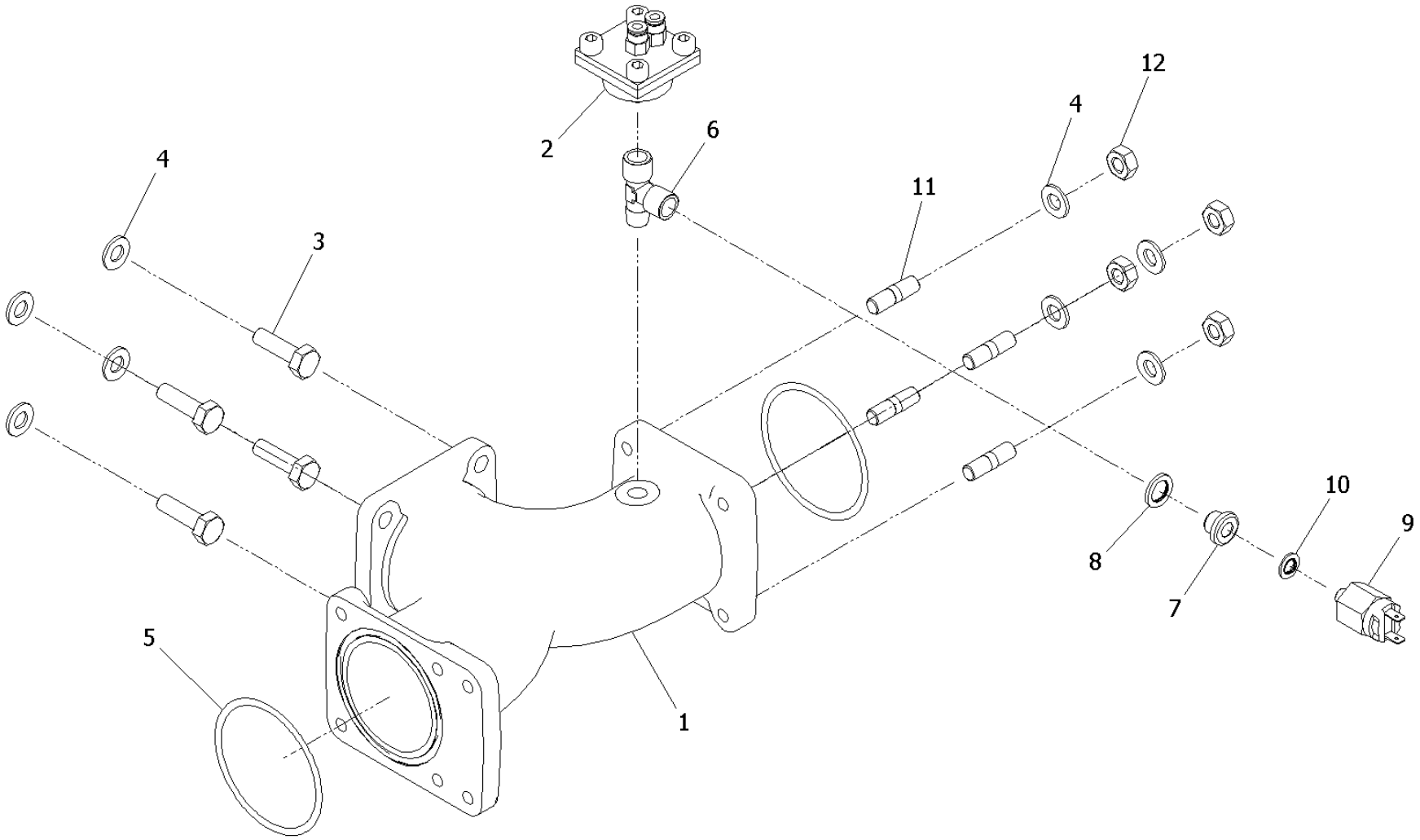
SmartCAFS50 Foampipe Assembly – list

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	PIPE SUPPORT BRACKET	2	65426/005	65426/005	
2	SCREW, SS HEX HD M12x20	4	MS107/20	MS107/20	
3	WASHER, SS STD HVY M12	4	MS125/11	MS125/11	
4	FOAM SUPPLY PIPE	1	65488/001	65488/001	
5	CLAMP 2" DIA	2	59239	59239	
6	FOAM OUTLET PIPE	1	65519	65519	
7	VITAULIC BLANKING PLUG	1	65490	65490	
8	VICTAULIC STD JOINT 2" NOM BORE	2	61184/02	61184/02	
9	MINI FLOW SWITCH	1	61103	61103	

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CAFS delivery valve feed tee – illustration



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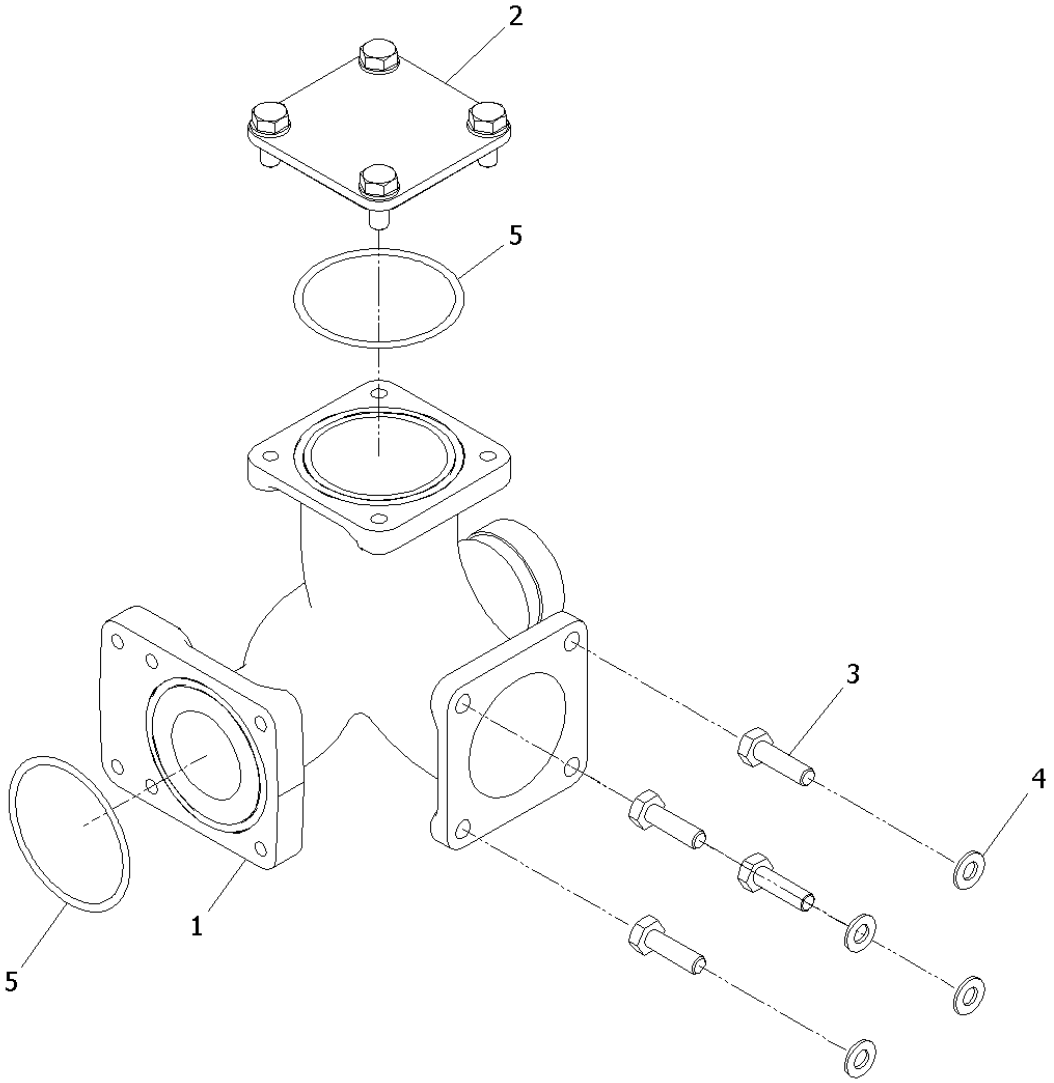
CAFS delivery valve feed tee – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	OUTRIGGER TEE MANIFOLD	1	65433/000	65433/100	
2	PRESSURE BALANCE VALVE ASSY	1	61215	61215	
3	SCREW, HEX HD M10x35	4	MS06/35	MS06/35	
4	WASHER, STD HVY M10	8	MS25/10	MS25/10	
5	O-RING ID 79.5 x 3.0	2	50092	50092	
6	EQUAL TEE	1	65572	65572	
7	REDUCING BUSH ¼"BSP X 1/8"BSP	1	65582	65582	
8	BONDED SEAL ¼" BSP	1	UFP2303/5	UFP2303/5	
9	PRESSURE SW 7 BAR N.C.	1	65586/001	65586/001	
10	BONDED SEAL 1/8"BSP SELF CENT	1	UFP2303/3	UFP2303/3	
11	STUD, M10x20	4	MS49/20	MS49/20	
12	NUT, FULL M10	4	MS35/9	MS35/9	

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Monitor / foam feed elbow assembly – illustration



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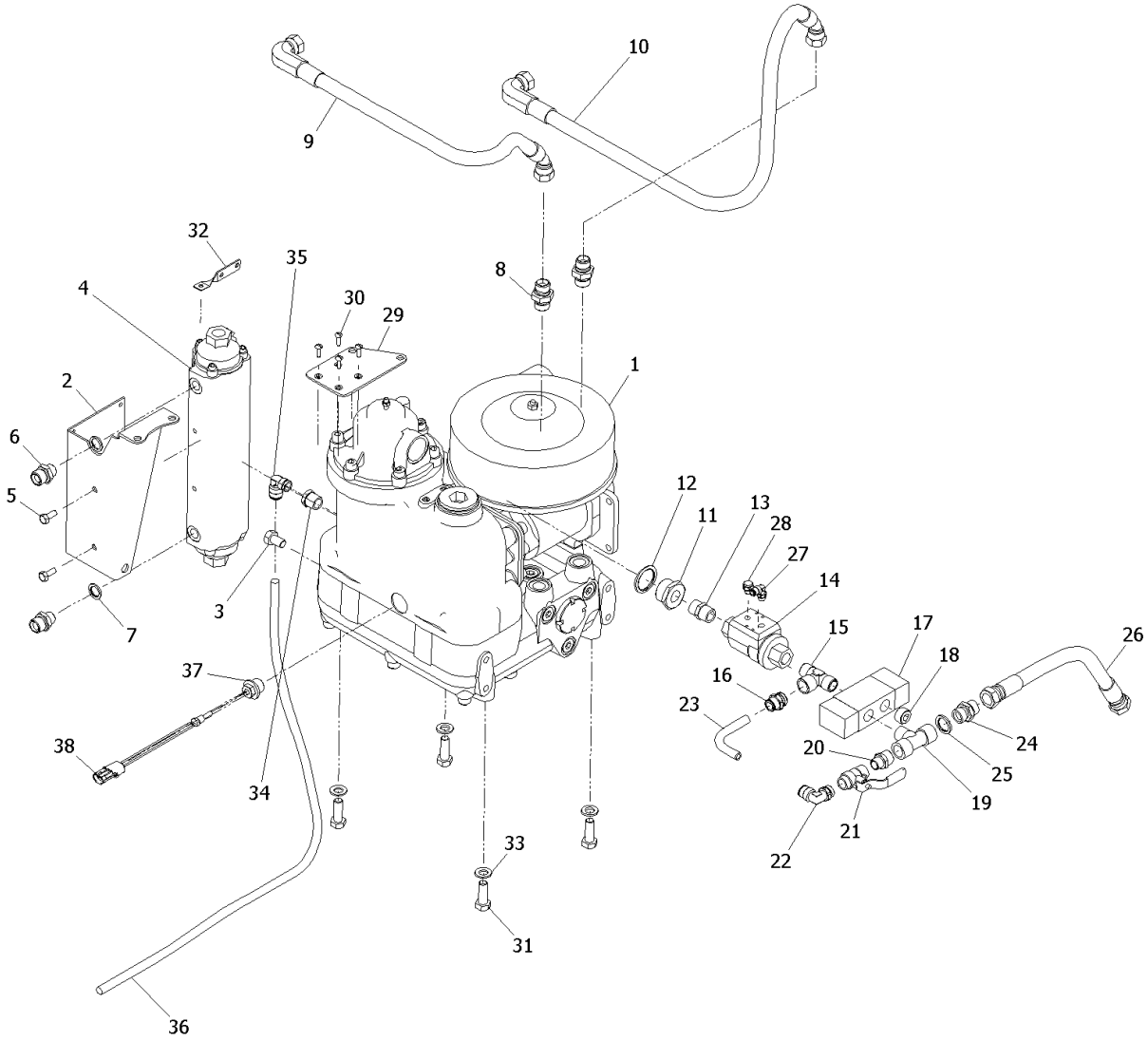
Monitor / foam feed elbow assembly – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	MONITOR FOAM FEED ELBOW	1	65421/000	65421/100	
2	MANIFOLD OUTRIGGER BLANK GROUP	1	65192	65192	
	Comprises of -				
-	Blanking Plate	1	51281/09	51281/09	
-	Shim Plate	1	60300	60300	
-	Screw	4	MS06/25	MS06/25	
-	Washer	4	MS25/10	MS25/10	
3	SCREW, HEX HD M10x35	4	MS06/35	MS06/35	
4	WASHER, STD HVY M10	4	MS25/10	MS25/10	
5	O-RING ID 79.5 x 3.0	2	50092	50092	

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Compressor Assembly 50SCFM - illustration



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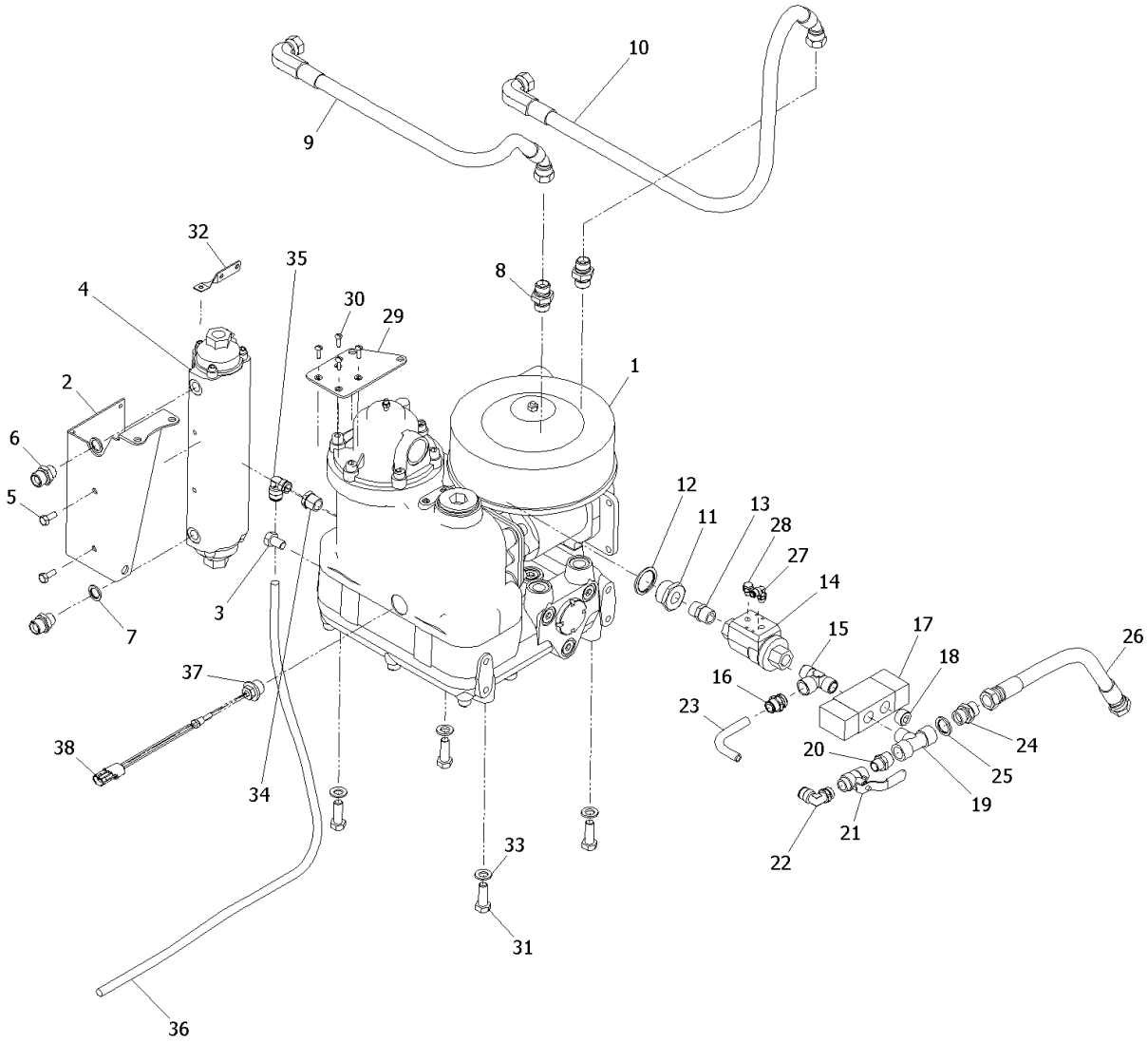
Compressor Assembly 50SCFM - List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	ROTARY A/C ASSEMBLY	1	59070/01	59070/01	
2	BRACKET - OIL COOLER MOUNTING	1	65428/002	65428/002	
3	SCREW, HEX HD M12x20	1	MS07/20	MS07/20	
4	HEAT EXCHANGER	1	59075	59075	
5	SCREW, HEX HD M8x20LG	2	MS05/20	MS05/20	
6	ADAPTOR G0.5 TO G0.375	2	59184	59184	
7	BONDED SEAL 3/8" BSP SELFCENTER	2	UFP2303/7	UFP2303/7	
8	ADAPTOR G½" (M) TO G½" (M)	2	59182	59182	
9	OIL INLET/OUTLET HOSE	1	65493	65493	
10	OIL INLET/OUTLET HOSE	1	65493	65493	
11	REDUCING BUSH	1	65584/001	65584/001	
12	BONDED SEAL 1" BSP	1	UFP2303/13	UFP2303/13	
13	MALE ADAPTOR EQUAL	1	59086/001	59086/001	
14	AIR VALVE ½" BSP	1	59107/03	59107/03	
15	EQUAL TEE	1	65571	65571	
16	STRAIGHT ADAPTOR PUSH IN 12-½"	1	59082/09	59082/09	
17	3/2 SOLENOID VALVE N/C	1	65585	65585	
18	INT HEX HEAD PLUG ½" BSPT	1	60098	60098	
19	EQUAL TEE ½" BSP	1	59190	59190	
20	MALE ADAPTOR UNEQUAL	1	65583	65583	
21	BALL VALVE 3/8" BSP	1	65529	65529	
22	SWIVEL ELBOW CONN 12-3/8"	1	59189/02	59189/02	
23	NYLON TUBING (BLACK)	1	56221MA	56221MA	
24	60° MALE ADAPTOR	1	65580	65580	
25	BONDED SEAL ½"BSP SELF CENT	1	UFP2303/8	UFP2303/8	
26	AIR HOSE	1	65553	65553	
27	SWIVEL ELBOW CONNECTOR	1	59189/01	59189/01	
28	SILENCER 1/8" BSP	1	59085	59085	
29	BLOW DOWN VALVE MOUNTING PLATE	1	65497	65497	

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Compressor Assembly 50SCFM - illustration



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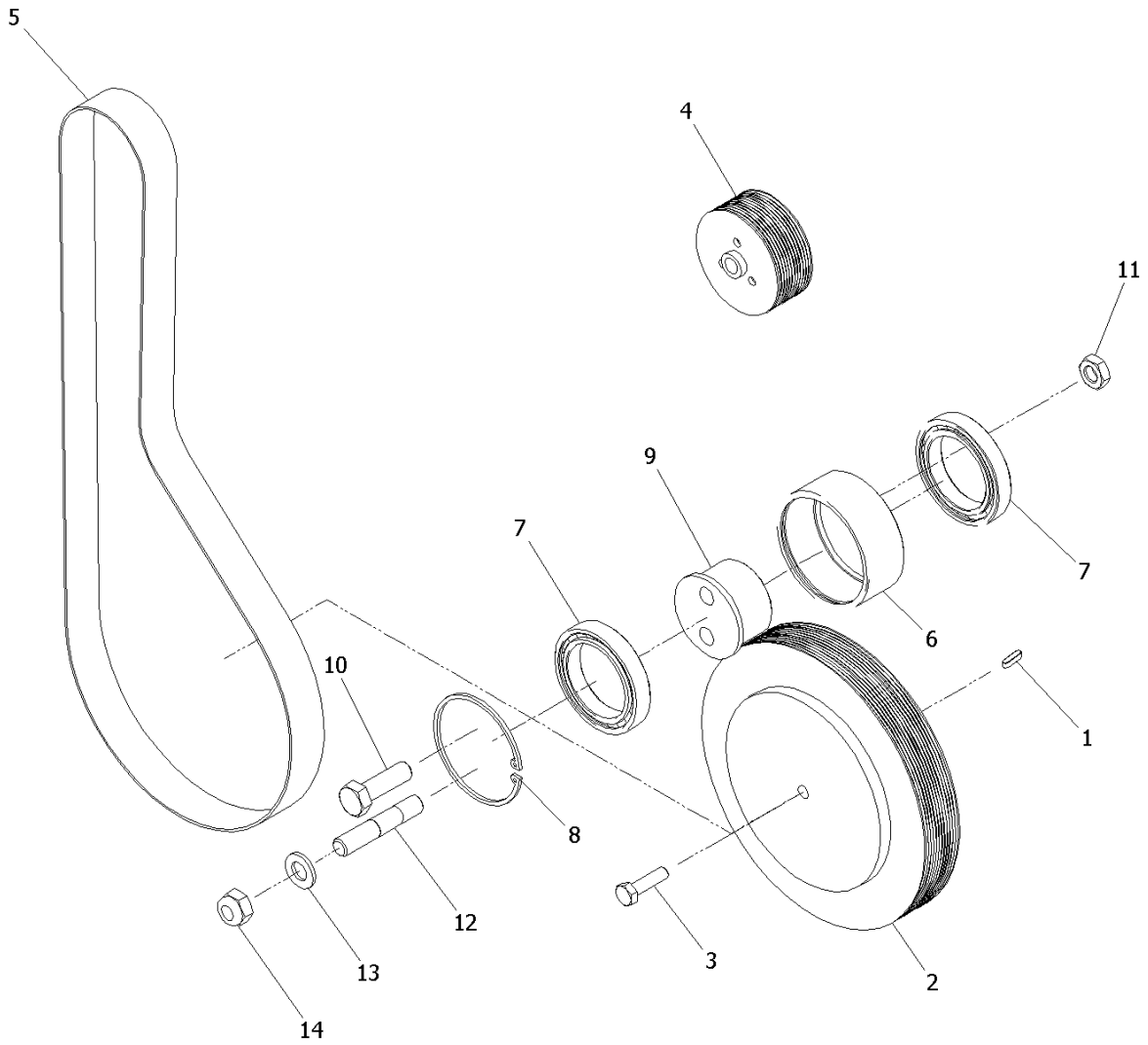
Compressor Assembly 50SCFM - List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
30	SCREW, SS PAN HEAD M5x16	4	MS170/31	MS170/31	
31	SCREW, SS HEX HD M12x35	4	MS107/35	MS107/35	
32	DIPSTICK MOUNTING BRACKET	1	65603	65603	
33	WASHER, SS STD HVY M12	4	MS125/11	MS125/11	
34	REDUCING BUSH ½"-3/8" BSP BRS	1	53506/01	53506/01	
35	ELBOW CONNECTOR 12 D 3/8"	1	59083/02	59083/02	
36	NYLON TUBING (BLACK)	1	56221MA	56221MA	
37	THERMISTOR ADAPTOR	1	59207	59207	
38	TEMPERATURE SENDER 10KP	1	200-1161-00-0	200-1161-00-0	

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Compressor Drive Assembly – illustration



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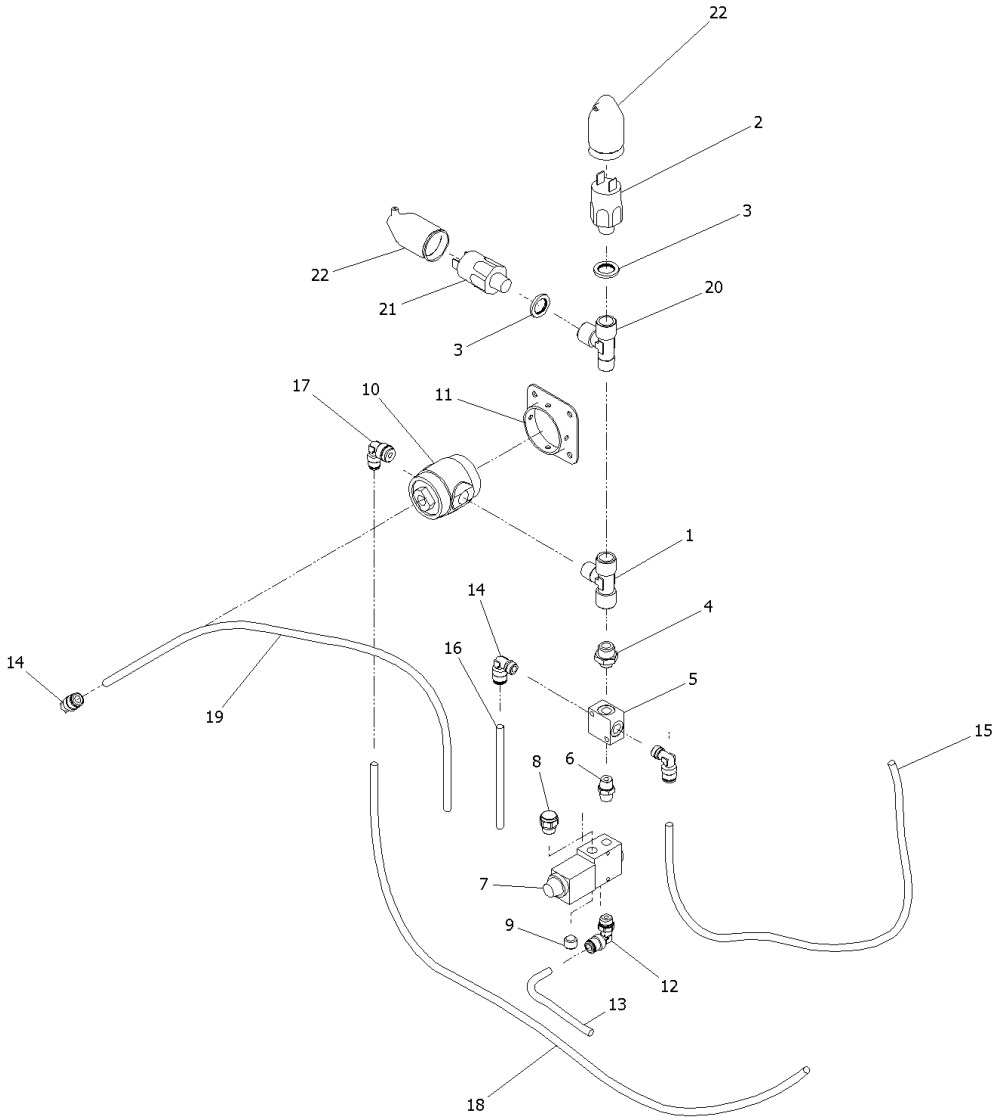
Compressor Drive Assembly - List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	KEY PARALLEL 4mm SQUARE	1	MS179/24	MS179/24	
2	CLUTCH DRIVE ASSY 24 VOLT	1	60577	60577	
3	SCREW, HEX HD M8x30	1	MS05/30	MS05/30	
4	DRIVEN PULLEY	1	60574	60574	
5	DRIVE BELT "POLYDRIVE"	1	60578/01	60578/01	
6	SLEEVE	1	60573	60573	
7	BEARING	2	60579	60579	
8	CIRCLIP (DIN 1300-72)	1	53527	53527	
9	ECCENTRIC	1	60571/01	60571/01	
10	SCREW, HEX HD M12x40	1	MS07/40	MS07/40	
11	NUT, THIN M12	1	MS36/10	MS36/10	
12	STUD, M12x50	1	MS50/55	MS50/55	
13	WASHER, STD HVY M12	1	MS25/11	MS25/11	
14	NUT, NYLOC M12	1	MS41/7	MS41/7	
-	Please note – items 6,7,8,9,10,11 are available as a complete Tensioner Pulley Assembly	1	65447/002	65447/002	

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Pneumatic Components - illustration



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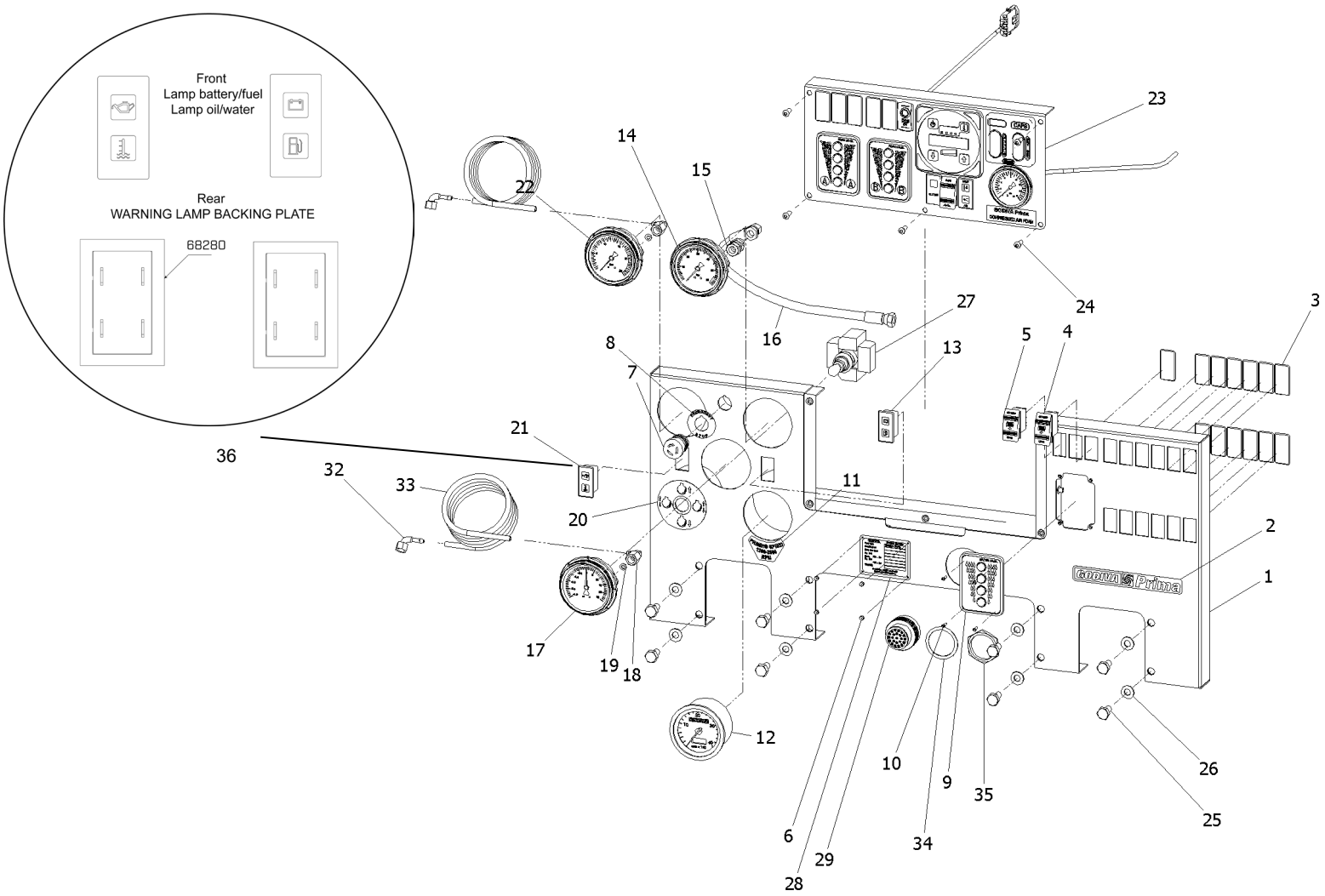
Pneumatic Components – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	TEE G¼" (F) G¼ (F) R¼ (M)	1	70089	70089	
2	PRESSURE SWITCH	1	53635/02	53635/02	
3	BONDED SEAL ¼" BSP	2	UFP2303/5	UFP2303/5	
4	BRASS REDUCING CONN ¼BSPT 1/8BSPT	1	61039	61039	
5	MANIFOLD 1/8" BSP	1	59084	59084	
6	MALE/MALE ADAPTOR 1/8"-1/8"	1	59086	59086	
7	SOL VALVE 4-WAY 24V DC ASSY	1	59081/01	59081/01	
8	SILENCER 1/8" BSP	1	59085	59085	
9	INT HEX HEAD PLUG	1	60098/02	60098/02	
10	BLOW DOWN VALVE	1	038-1560-00-0	038-1560-00-0	
11	BRACKET	1	019-3310-36-0	019-3310-36-0	
12	SWIVEL ELBOW CONN. 6-1/8"	1	59189/01	59189/01	
13	NYLON TUBING (6DIA)	1	59089MA	59089MA	
14	ELBOW CONNECTOR PUSH-IN	3	59083	59083	
15	NYLON TUBING (6DIA)	1	59089MA	59089MA	
16	NYLON TUBING (6DIA) (NATURAL)	1	59089MA	59089MA	
17	ELBOW CONNECTOR PUSH-IN	1	59083/01	59083/01	
18	NYLON TUBING (6DIA) (NATURAL)	1	59089MA	59089MA	
19	NYLON TUBING (6DIA)	1	59089MA	59089MA	
20	EQUAL TEE	1	65572	65572	
21	PRESSURE SWITCH	1	53635/04	53635/04	
22	SHROUD	2	57284	57284	

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Instrument Panel – illustration



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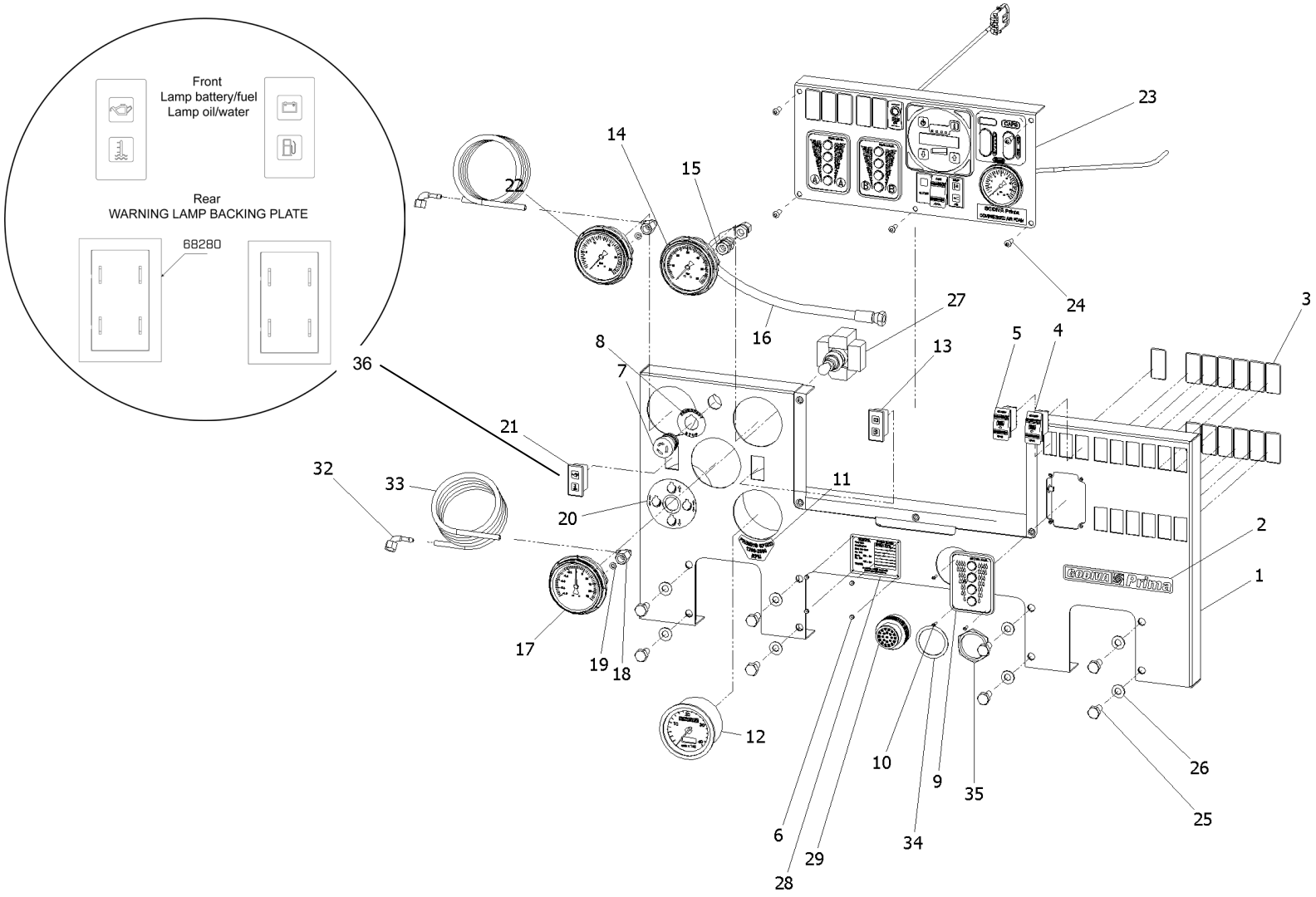
Instrument Panel – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	INSTRUMENT PANEL 45-45 HP/LP	1	65533	65533	
2	LABEL - GODIVA PRIMA	1	65435	65435	
3	SWITCH MOUNT BLANKING PLUG	13	60536	60536	
4	SWITCH-HOSEREEL RIGHT	1	60533/54	60533/54	
5	SWITCH-HOSEREEL LEFT	1	60533/53	60533/53	
6	RIVET - ST.ST	4	53831	53831	
7	EMERGENCY STOP SWITCH	1	61004/001	61004/001	
8	LABEL-EMERGENCY STOP	1	65559	65559	
9	INT WTR LVL 24V 10' SING DISP	1	C1-ITL12099	C1-ITL12099	
10	SCREW, C/SUNK M3x10	4	MS72/30	MS72/30	
11	LABEL - PRIMA PRIMING SPEED	1	65434/001	65434/001	
12	TACHOMETER/HRS COUNTER 24V Ø80	1	60305	60305	
13	LAMP BATTERY/FUEL RED/AMBER	1	60535/04	60535/04	
14	80MM PRESSURE GAUGE 0-60 BAR	1	C1-1330014	C1-1330014	
15	GAUGE CONNECTION TO ¼"BSP	1	60766	60766	
16	GAUGE HOSE HIGH PRESSURE	1	60753/02	60753/02	
17	80MM PRESSURE GAUGE -1-25 BAR	1	C1-1330015	C1-1330015	
18	GAUGE CONNECTION - SPECIAL	2	52804/01	52804/01	
19	WASHER	2	50470	50470	
20	LABEL SPEED UP/DOWN/IDLE	1	61017	61017	
21	LAMP OIL/WATER RED/RED	1	60535/03	60535/03	
22	80MM PRESSURE GAUGE 0-25 BAR	1	C1-1330013	C1-1330013	
23	FOAM PANEL FOAM A & B	1	65610/002	65610/002	See page 87 for details
24	BUTTON HD SCREW M6x16U/HD	5	56192	56192	
25	SCREW, SS HEX HD M10x20	8	MS106/20	MS106/20	
26	WASHER, SS STD HVY M10	8	MS125/10	MS125/10	
27	JOYSTICK (4-POS'N)	1	61003/02	61003/02	
28	CEN SERIAL NO PLATE PRIMA	1	65501/XXX	65501/XXX	

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Instrument Panel – illustration



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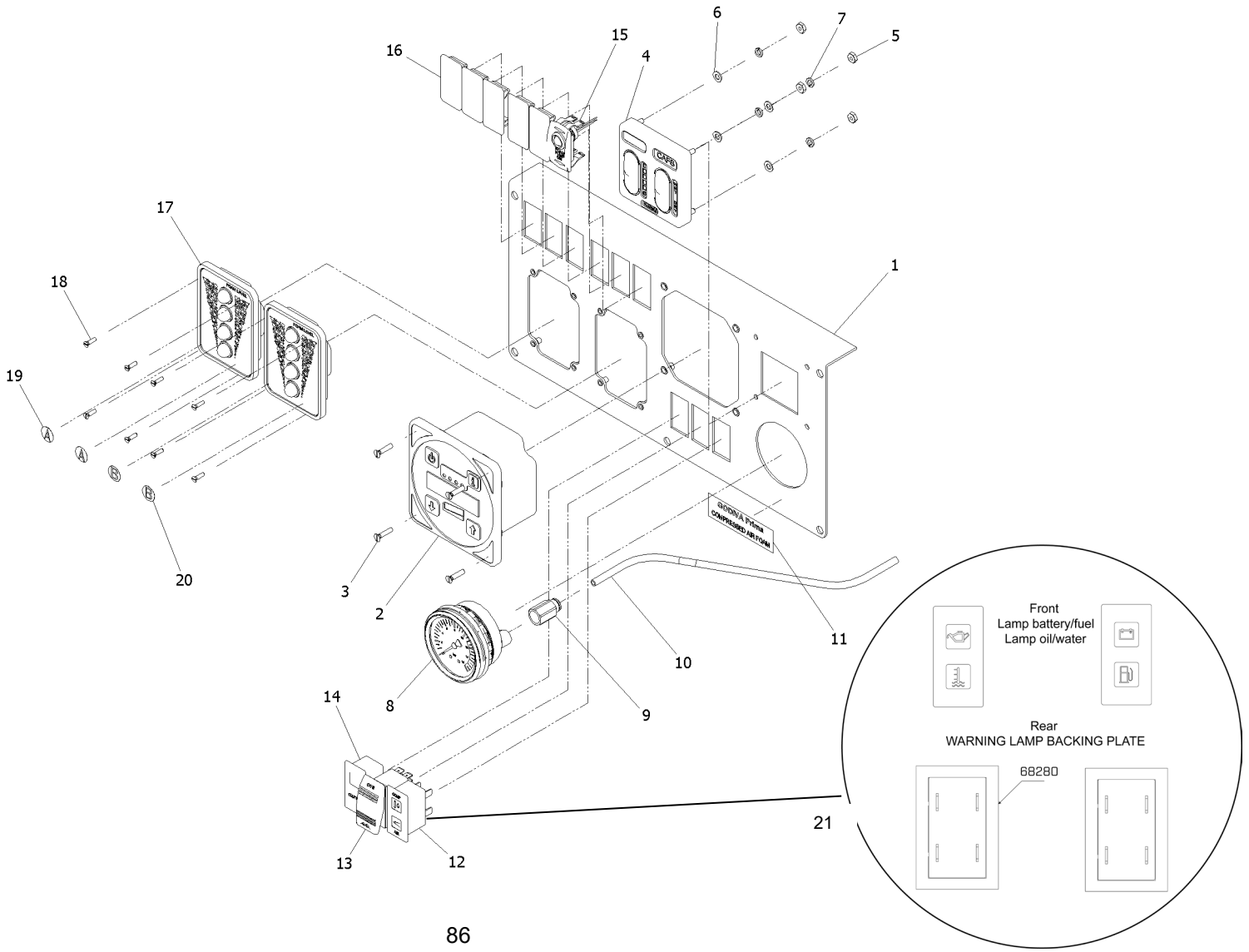
Instrument Panel – List

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
29	MULTI-PIN PLUG	1	60764	60764	
30	FEMALE PINS FOR PLUG	23	60765	60765	
31	WIRING HARNESS GROUP-24V	1	65545	65545	
32	ELBOW 90° ¼" BSP	2	7762	7762	
33	NYLON TUBE 5/16" OD x .212" ID	2	7763MA	7763MA	
34	LOCK WASHER	1	60763/03	60763/03	
35	NUT	1	60763/02	60763/02	
36	WARNING LAMP BACKING PLATE 1.2	2	68280	68280	

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Foam/CAFS Instrument Panel – illustration



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Foam/CAFS Instrument Panel – list

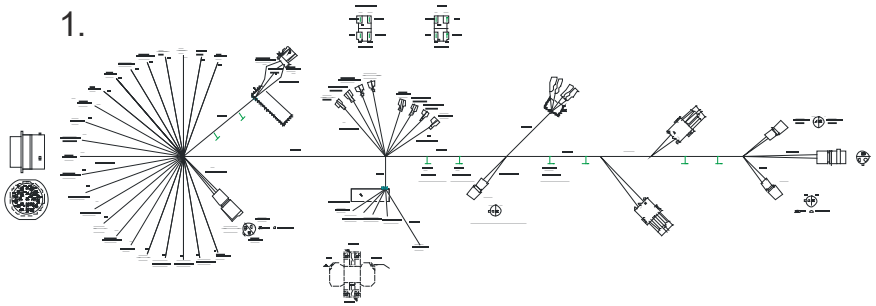
ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	FOAM INSTRUMENT PANEL	1	65534	65534	
2	FOAMLOGIX DISPLAY HD(DIGITAL)	1	C1-111530	C1-111530	
3	SCREW, SS C/SUNK M4x16	4	MS172/40	MS172/40	
4	SPS PANEL SMARTCAFS	1	C1-114643	C1-114643	
5	HEX NUT NO 8-32UNC ZINC PLATED	4	61266	61266	
6	WASHER, SS STD HVY M5	4	MS125/6	MS125/6	
7	WASHER,SS SPG SQ M	4	MS129/4	MS129/4	
8	60MM PRESSURE GAUGE 0-16 BAR	1	C1-1220038	C1-1220038	
9	STRAIGHTCONN PUSH-IN 6-1/4	1	59229/01	59229/01	
10	NYLON TUBING (6 DIA) (NATURAL)	1	59089MA	59089MA	
11	LABEL - GODIVA PRIMA COMPRESSED	1	65535	65535	
12	LAMP COMP/AIR RED/GREEN	1	60535/10	60535/10	
13	SWITCH - CAFS/FOAM	1	60533/25	60533/25	
14	LAMP CLUTCH GREEN	1	60535/12	60535/12	
15	LAMP & HARN ASSY FOAM PUMP ON	1	60535/11	60535/11	
16	SWITCH MOUNT BLANKING PLUG	5	60536	60536	
17	INT FOAM LVL 24V 10' SING DISP	2	C1-ITL12111	C1-ITL12111	
18	SCREW, C/SUNK M3x10	8	MS72/30	MS72/30	
19	FOAM 'A' LABEL	2	59533	59533	
20	FOAM 'B' LABEL	2	59533/01	59533/01	
21	WARNING LAMP BACKING PLATE 1.2	2	68280	68280	

IDEX FIRE SUPPRESSION GROUP

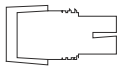
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Wiring harness identification – illustrations

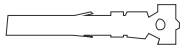
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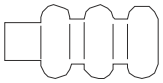
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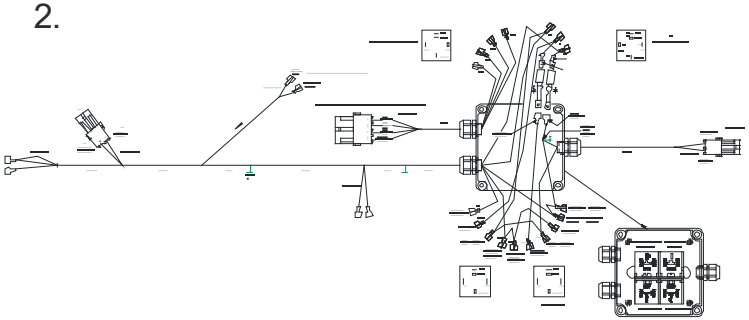
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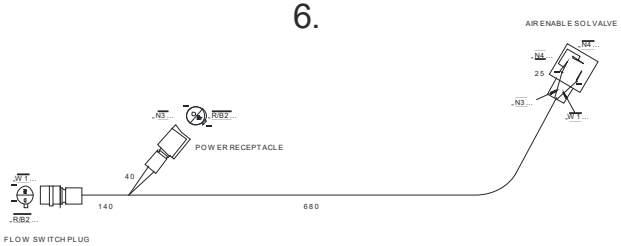
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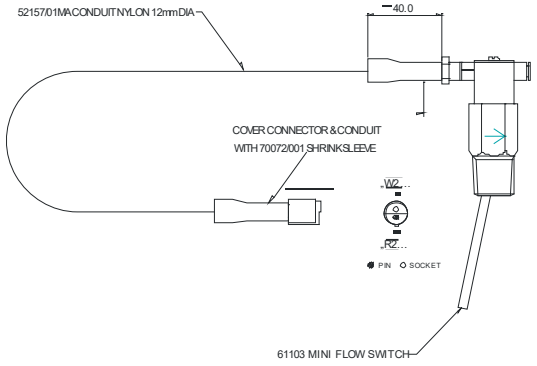
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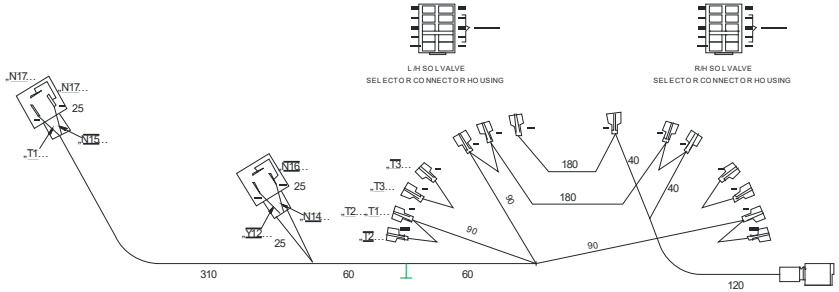
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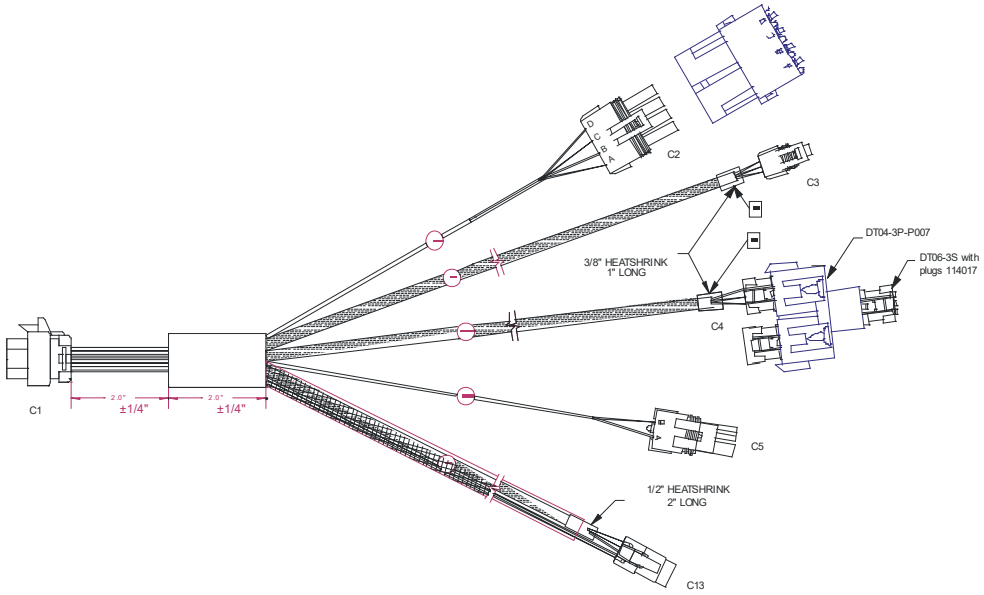
Wiring harness identification – list

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
1	Engine control full harness	1	65573	65573	
2	Clutch relay and encl. harness	1	65574	65574	
3	Connector, 2-way tower sealed	1	59096/01	59096/01	
4	Female terminal pin	2	59097/01	59097/01	
5	Seal, weather pack	2	59346	59346	
6	Air restrict harness	1	65575	65575	
7	Flow switch and connector assembly	1	65579	65579	
8	HP discharge valve harness	1	65576	65576	

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Wiring harness identification – illustrations



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Wiring harness identification – list

ITEM	DESCRIPTION	QTY	ALUMINIUM	GUNMETAL	NOTES
9	Harness 14’ FoamLogix Control head	1	C1-113438	C1-113438	
10	Harness CAFS 50 Prima	1	C1-118360	C1-118360	
11	Relay 24V 10/20A	3	52504/04	52504/04	
12	Flasher unit 24V	1	65609	65609	

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10. DIAGRAMS

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PIPEWORK SCHEMATIC

MULTI-PIN CONNECTOR SHEMATIC CIRCUIT

WIRING DIAGRAM

PRIMING CLUTCH WIRING SCHEMATIC

FOAMLOGIX HARNESS

HARNESS SMARTCAFS50 PRIMA

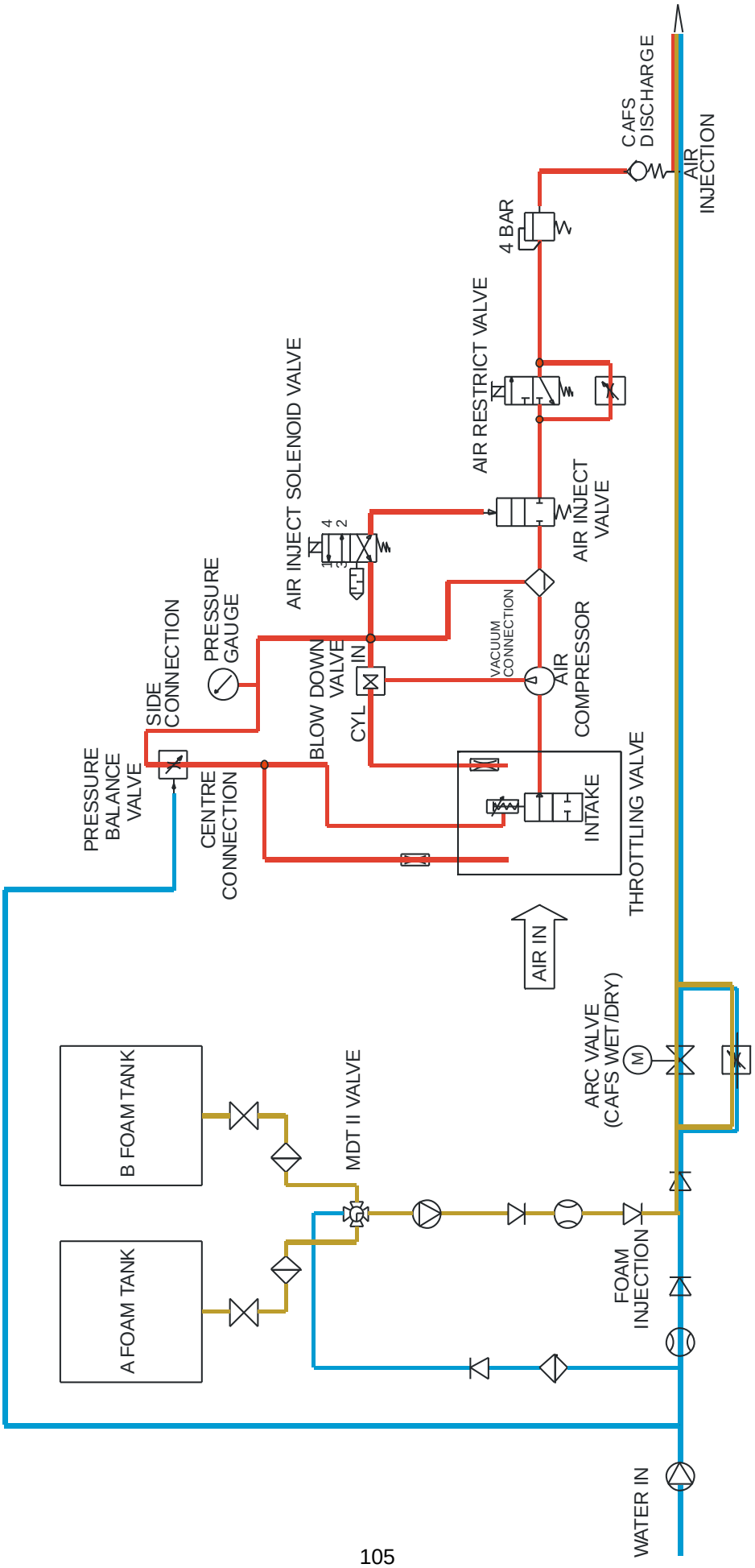
CLUTCH RELAY HARNESS

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PIPEWORK SCHEMATIC

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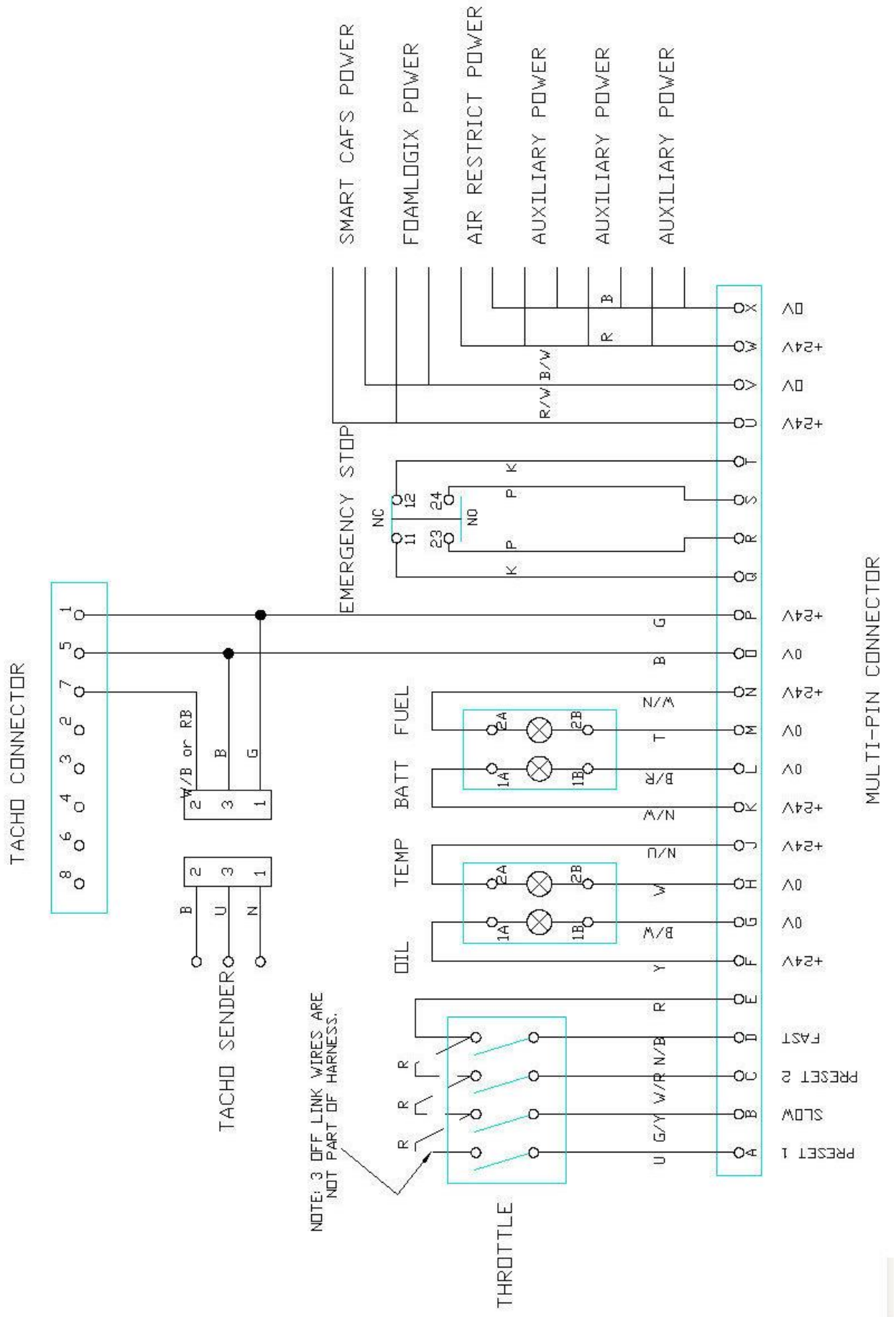
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MULTI-PIN CONNECTOR SHEMATIC CIRCUIT

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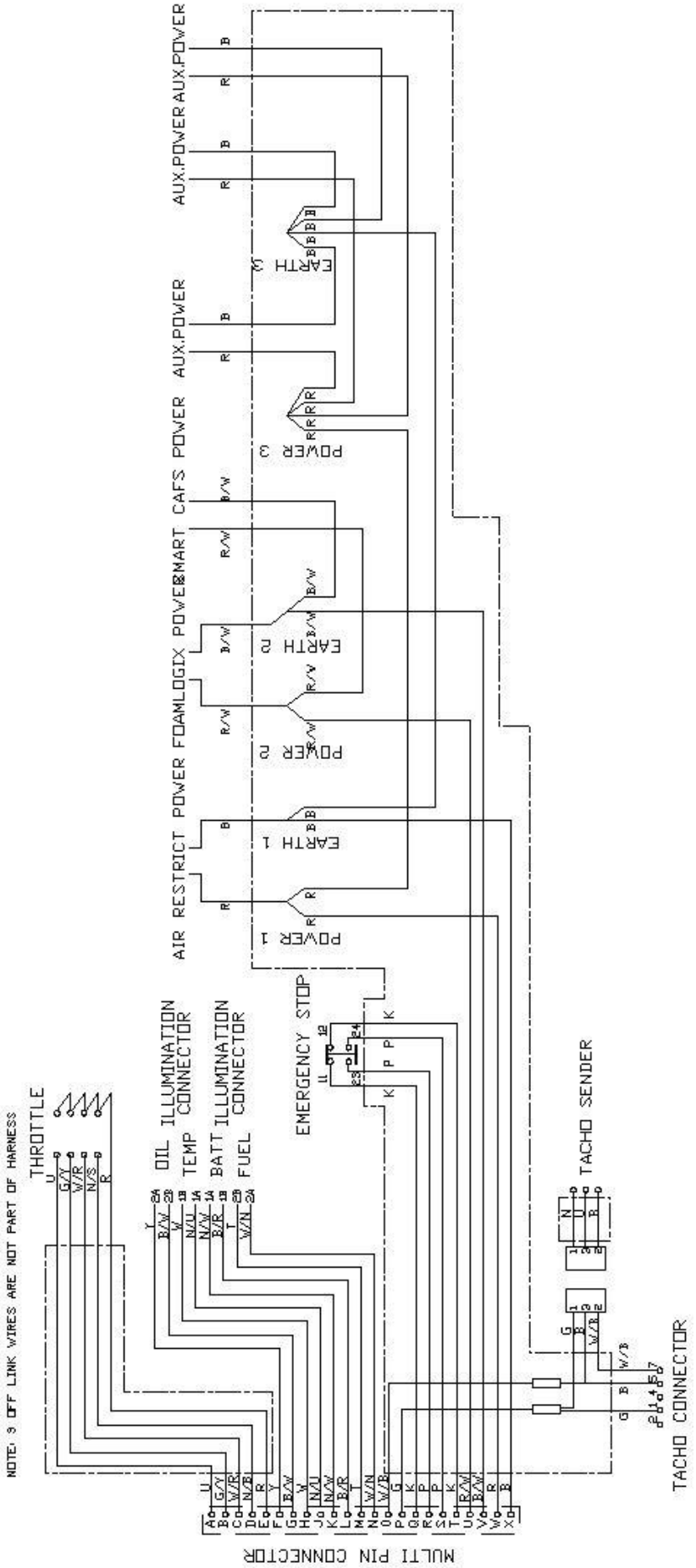
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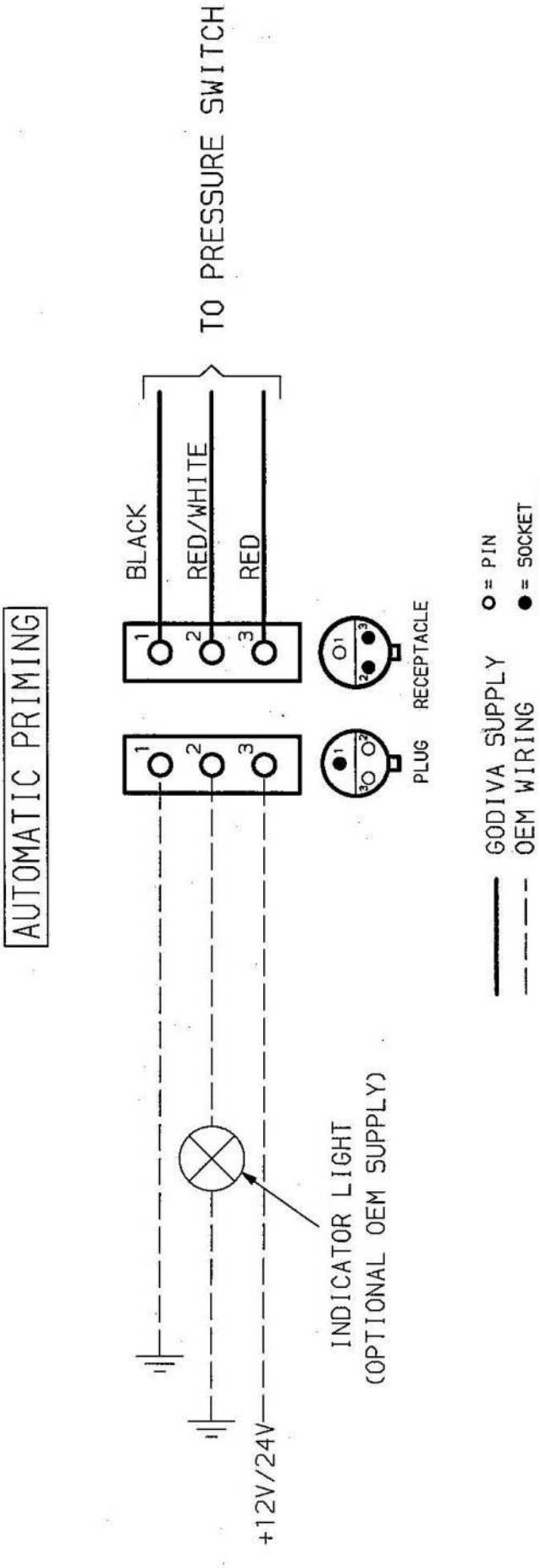
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PRIMING CLUTCH WIRING SCHEMATIC

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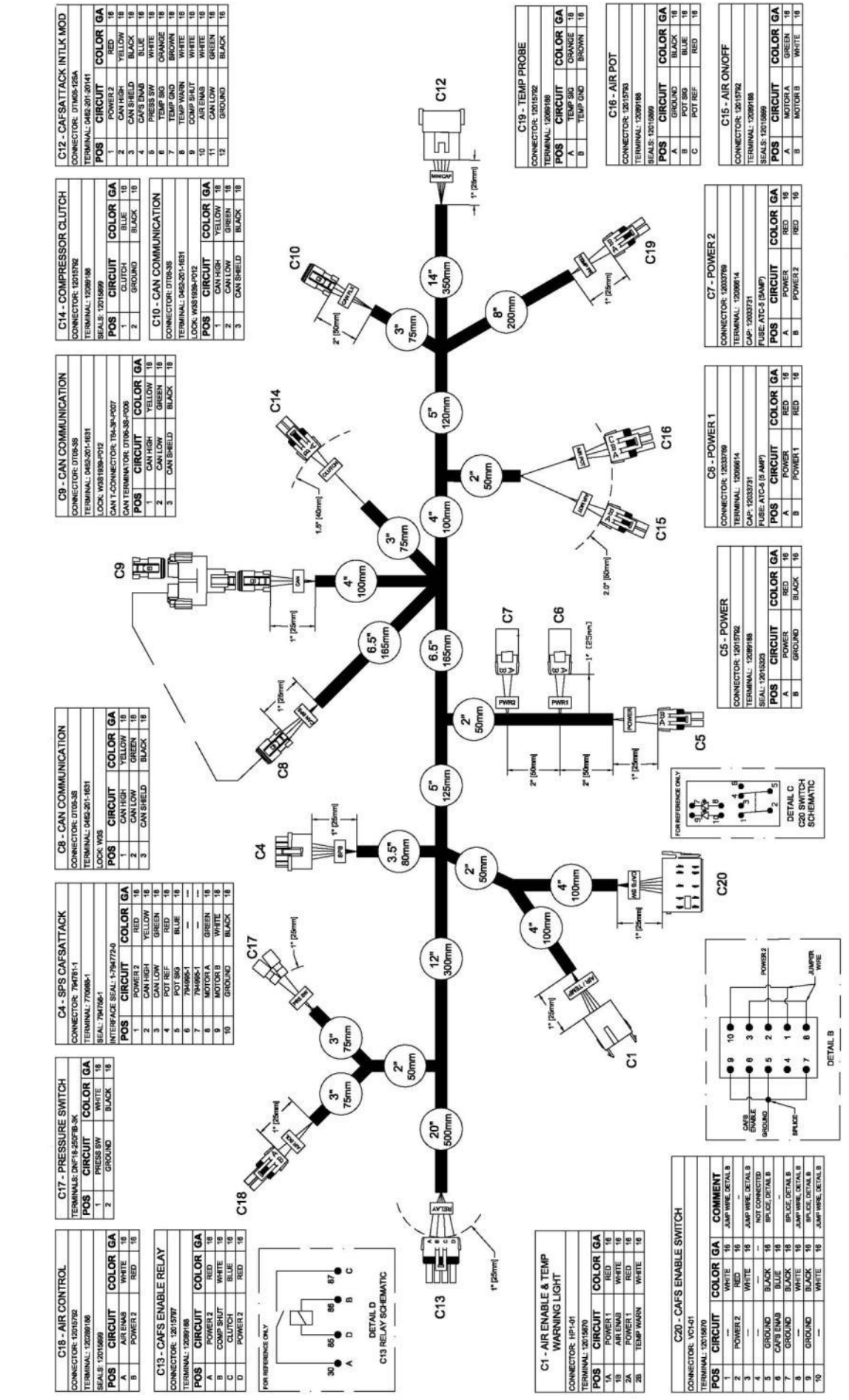
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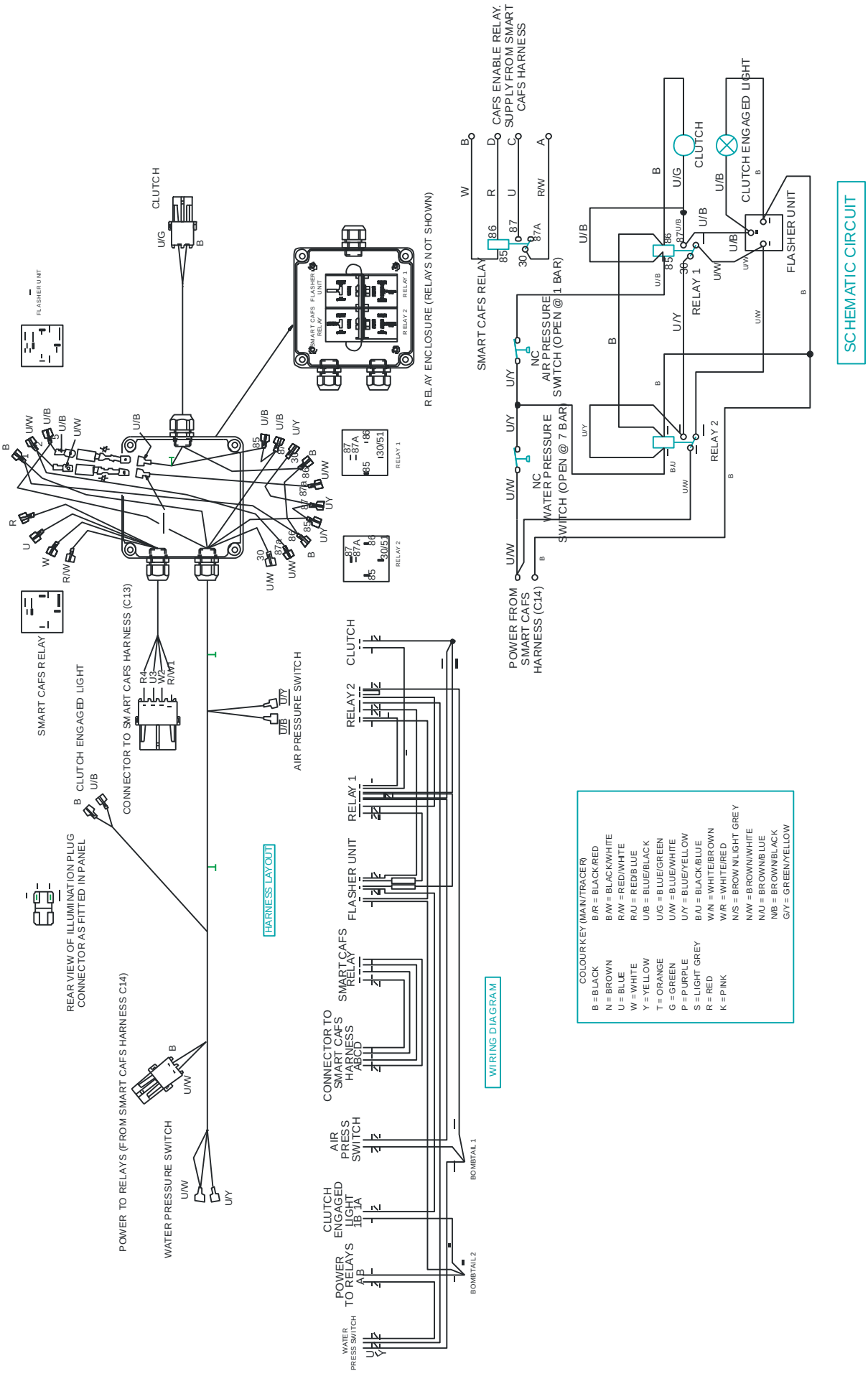


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CLUTCH RELAY HARNESS

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11. APPENDIX

This section contains supplementary technical manuals and information sheets relating to the Prima SmartCAFS equipment and components that are referred to in this document.

These will provide additional guidance in the identification of components, diagnosis of faults and the appropriate subsequent corrective actions.

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GODIVA PRIMA PUMP WORKSHOP MANUAL

GARDNER DENVER TEMPEST 3 COMPRESSOR MANUAL

GARDNER DENVER TEMPEST 6 COMPRESSOR MANUAL

GARDNER DENVER ENDURO 12 COMPRESSOR MANUAL

FOAMLOGIX INSTALLATION AND OPERATION MANUAL

NOZZLE FLOWRATE CHART (DS353)

INTELLI-TANK OPERATIONS MANUAL

FOAM FLOW SENSOR REPLACEMENT INSTRUCTIONS

PADDLEWHEEL FLOW SENSOR INSTRUCTIONS

SMARTCAFS INTERLOCK MODULE INSTRUCTIONS

SMARTCAFS SPS PANEL INSTRUCTIONS

SMARTCAFS MANIFOLD ASSEMBLY

SMARTCAFS ACTUATOR ASEMBLY

FOAM CONCENTRATE COMPATIBILITY LIST

THERMAL RELIEF VALVE INSTRUCTIONS GP/265

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GODIVA Prima

Workshop Manual

P1 Single Pressure Model
P2 Twin Pressure Model



Prima P1



Prima P2

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GP/290
Issue 8, Jan 2023

AMENDMENT RECORD

Model: Prima, single and twin pressure models

Mod No.	Date	Page/s	Amendment	New Issue No.
1	June 2011	All	New publication	
2	March 2012	44	Gearbox oil capacity revised to 1.2 litres	2
3	March 2012	48	Water ring primer – 3mm lift-off gap	2
4	May 2013	60	Adhesives and solvents list added	3
5	March 2014	19	Modify information on seal assembly installation	4
6	November 2015	55-57	More detail on valve maintenance	5
7	July 2016	14	Improved impeller nut tightening process	6
8	July 2016	54	SPRV maintenance detail	6
9	May 2019	43	Specify a tightening torque of 3.0Nm when fitting the 60015/001 sender to the bearing housing.	7
10	July 2019	9, 60-61	Delivery valve maintenance - more detail	7
11	Jan 2023	11,15,16 67,68	Lowering the Recommended Torque for the front and rear wear ring to 8Nm	8

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SAFETY

Please read this manual before operating the machinery.
Safety notices -



= non-compliance could affect safety

IMPORTANT = in case of damage to pump

In operation

- Rotating parts must be guarded against accidental contact.
- Do not insert items into the suction tube when pump is running.
- Discharge hoses must not be disconnected when the unit is running.
- No components must be unfastened when the unit is running.
- When installing or removing the pump, suitable lifting equipment must be used.
- Suitable ear protection must be worn when pump is running – if necessary.

Training

Godiva pumps must only be operated by trained personnel.

Maintenance

The user must maintain the equipment in an operational condition, as per regulation 5 in the Provision and Use of Work Equipment Regulations 1998.

Environmental Protection

Used oil from the pump must be disposed of in accordance with your local regulations

Risk Assessment

It is the duty of the pump installer to make a risk assessment of their operations when installing the pump, please contact Godiva Ltd. if assistance is required.

Transportation and Storage

The pump is supplied mounted on a wooden pallet and covered with a tri-walled cardboard box. This protection is suitable for standard methods of freight handling using forklift trucks. No more than one pump should be stacked on top of another. The tri-walled cardboard box is not suitable for storage when open to the elements. The pump is sprayed internally with a moisture inhibitor when leaving the factory, this treatment may be required if the pump is in long term storage (6 months or more) before use. On receipt of the pump a full inspection must be carried out, if any damage has occurred please contact Godiva Ltd.

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Warranty

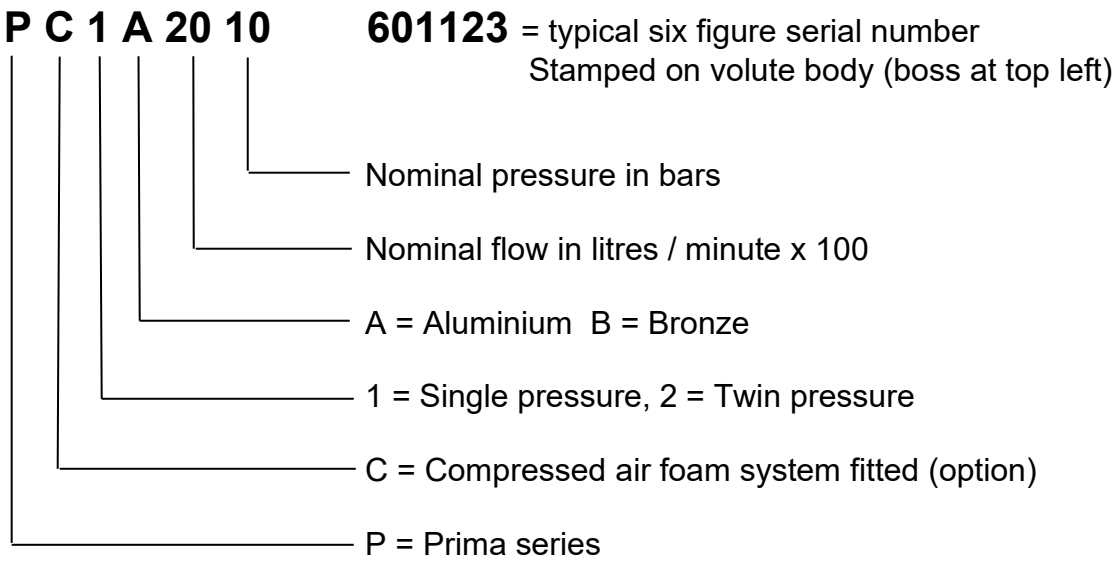
For all issues relating to warranty claims please contact Godiva Ltd.. Please be prepared to quote the six figure pump serial number located on the pump volute.

Gauges (if fitted)
Do not clean the glass surfaces of the gauges with abrasive or solvent cleaners. These will cloud the glass surface. Use a mild detergent and water.

Associated Publications

Publication	Part No
Installation and Operation Manual	GP/287
P1 Spare Parts Manual	GP/281
P2 Spare Parts Manual	GP/258

PUMP SPECIFICATION NUMBERING



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ENVIRONMENTAL PROTECTION

It is prohibited to pour oil and other contaminants onto the ground, down sewers, drains, or into water courses.
Dispose of lubricants through authorised waste disposal contractors, licensed waste disposal sites, or to the waste reclamation trade.
If in doubt, contact your Local Environmental Agency for advice regarding disposal policies.

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OPERATOR MAINTENANCE LOG

Pump serial number . . . . . .

Use this log to record faults, part replacements and major overhauls.
Please contact Customer Services at **Godiva Ltd.** prior to any proposed return of either a single part, or a complete assembly.

Date	Hours Run	Inspection / Fault	Parts Used	Reason For Renewal	Initial

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MAINTENANCE SCHEDULE

Maintenance intervals and action required

Interval	Action required	Items Required
After each use –	Flush pump through with clean water	Supply of clean water
Delivery valves (applies primarily to UK screw down type)	Check the valves open and close freely. Do not overtighten in either direction.	If the valve is stiff, report to workshop for repair.
Delivery valve	Check for leaks around the spindle	If valve is leaking, report to workshop for repair.
Delivery valve	Check the twist release mechanism operates freely and the seal inside the outlet is in place	If the twist release mechanism is stiff, report to workshop for repair.
Delivery valve	Check visually for any damage	Report to workshop for repair
Every 3 months -		
Check oil level in bearing housing	Remove filler/dipstick on bearing housing to check level	10w/40 or 15w/40 multigrade engine oil
Vacuum test	See separate instructions on page 32	
Pressure test – for tracing location of vacuum leak	See separate instructions on page 32	Access to pressurised water source
P2 - High pressure filter	Remove the filter from the housing and flush with clean water	
Delivery valve	Examine non-return flap rubber and pivot pin, spindle	Report to workshop for repair
Every 12 months -		
Change oil in bearing housing	Drain oil from bearing housing and refill with new oil	1 litre SAE10w/40 or 15w/40 multigrade engine oil
Change oil in gearbox -if fitted	Drain oil from gearbox and refill with new oil	1.2 litres BP Energol GR XP 68 or similar
Every 2 years -		
Piston primer seals in cover and body	See Maintenance Manual procedures	Repair kits Special tools (contact Godiva)
Thermal Relief Valve Test	See separate instructions on page 33	
Delivery valve	Examine valve spindle, re-grease or replace. Examine twist release mechanism	Report to workshop for repair

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REMOVAL & INSTALLATION

Introduction

Instructions particular to the repair of Godiva Prima Fire Pump series are detailed in the following sections.
These instructions describe the complete strip-down of the pump. To reduce unnecessary work and avoid the introduction of other issues, only dismantle those parts necessary to effect inspection and or repair.

P1 and P2 Models – for both pumps the majority of parts are common. Where parts are unique to the P1 or P2 pump, this is indicated in the text.

Precautions

Before carrying out repair work, take the following precautions:

- Drain the volute of water.

Post Repair and Assembly

On completion of work:

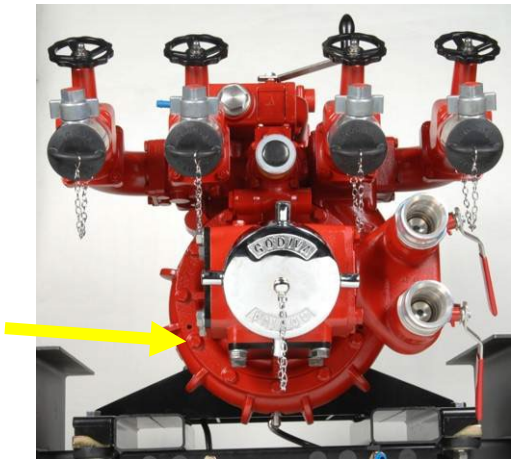
- Carry out vacuum test.
- Complete the maintenance log.

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1. Suction tube and front wearing ring

Removal

1.1 Undo the 12 x hexagon head bolts (shown).
If necessary remove the tank to pump line, collecting head and RTP unit.
Disconnect the vacuum gauge tubing from the top of the suction tube.

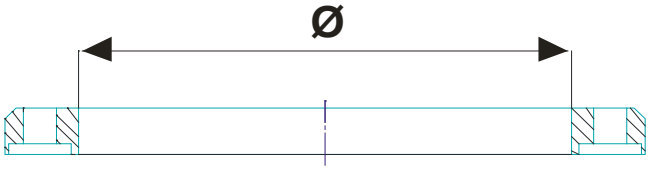


To remove and replace the front wearing ring in the locating bore in the suction cover plate, undo the 4 x cap screws and washers

Check the large internal diameter of the wearing ring in several places. If dimension A exceeds the limit given in the table the wearing ring must be replaced.

Pump	Internal Ø Limit - mm
P1_2010 / P2_3010	140.16 / 140.10
P1_4010	170.685 / 170.632
P1_6010	187.07 / 187.00

Pump	Internal Ø Limit - mm
P2_2010 / P2_3010	140.16 / 140.10
P2_4010	170.685 / 170.632
P2_6010	187.07 / 187.00



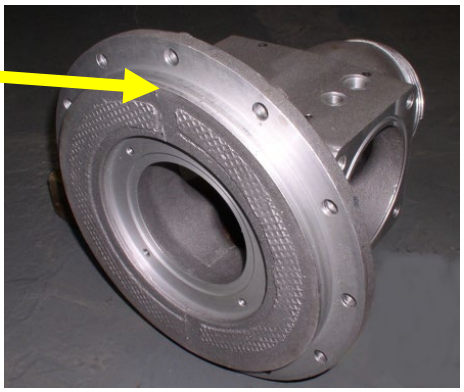
Installation

Installation is the reverse of removal noting:
When replacing the front wear ring apply Loctite 243 to screw threads and torque to 8 Nm.

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Insert the O ring (65097) in the O ring groove on the locating diameter on the suction tube cover plate (shown).

O ring here



Re-connect the collecting head, vacuum gauge tubing and tank to pump line (or blanking plates for tank to pump apertures if fitted).

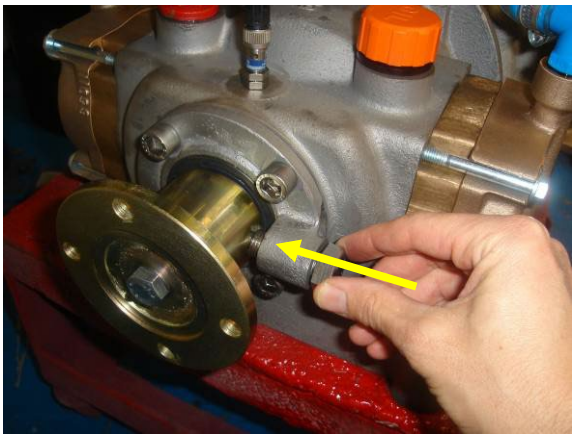
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2. Low Pressure Impeller

Removal

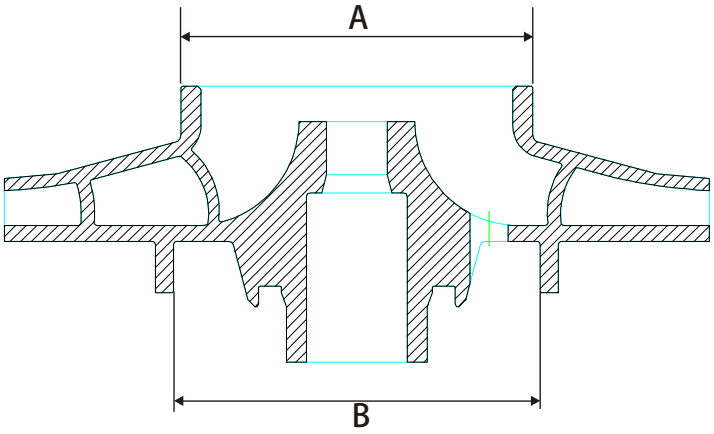
To remove and inspect the low pressure impeller, remove the suction tube and associated parts as described in section 1. This gives direct access to the low pressure impeller leaving the volute body in-situ.

To remove the impeller it may be necessary to fit a shaft locking screw in the aperture provided at the rear of the bearing housing. Remove the impeller nut and the pair of lock washers, withdraw the impeller from the keyed pump shaft.



Check the wearing diameter on the impeller in several places. If the diameter is less than stated in the table below, a new impeller should be fitted.

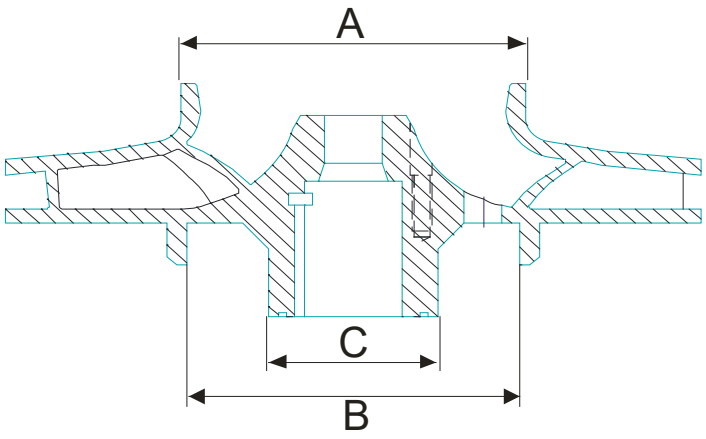
P1 Model



Pump	Front Diameter A mm	Rear Diameter B mm
P1_2010 / 3010	139.3 mm	146.1
P1_4010	169.5 mm	170.8
P1_6010	188.6mm	184.2

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P2 Model



Pump	Front Diameter A mm	Rear Diameter B mm	Hub Diameter C mm
P2_2010 / 3010	139.70 / 139.65	134.93 / 134.88	68.05 / 68.00
P2_4010	170.06 / 170.00	170.47 / 170.40	68.05 / 68.00
P2_6010	186.25 / 186.20	188.07 / 188.00	68.05 / 68.00

Installation

Apply a small amount of tallow to the bore of the low pressure impeller.
Place a new O ring into the end face groove of the impeller.
Place the impeller on the shaft.
Place a new set of Nord-Lock washer on to the shaft and up against the impeller.
Note: the Nord-Lock washer comprises of two mating parts, ensure the two parts are not separated and kept together as one washer.
Apply Anti-Seize grease to the threaded section of the shaft and to the face of the nut bearing against the Nord-Lock washer.
Suitable Anti-Seize grease products are -
Loctite Anti-Seize 8023 (Loctite catalogue no. 37625)
Copaslip Anti-Seize (made by Molyslip Atlantic Ltd.) or a similar product.

Tighten the locking nut to a torque of 300Nm.
Next check the fitting is correct - undo the nut slowly, you should hear a sharp click sound, as the nut becomes loose.
If you hear a click this indicates that the nut and Nord-Lock washer are functioning correctly. Re-tighten the nut to 300 Nm.

3. Rear Wear Ring

P1 Model

Removal

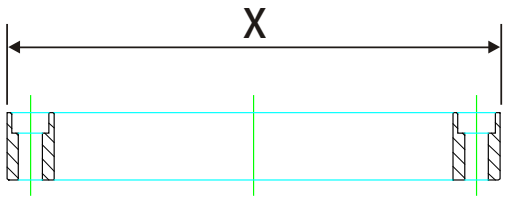
The rear wear ring is accessible when the low pressure impeller is removed.

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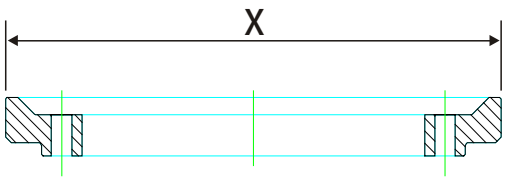
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To remove the wear ring undo the four screws and washers retaining the ring against the pump head. The wear ring can be eased away from the pump head by means of two screws inserted into the adjacent tappings.

Check the wearing diameters as follows –



P1_2010/3010



P1_4010/6010

Pump	Ø X
P1_2010/3010	144.9mm
P1_4010	169.5mm
P1_6010	183mm

Installation

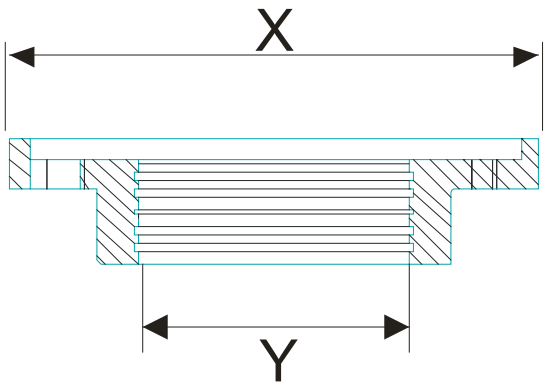
When relocating the rear wear ring into the pump head, ensure the priming port in the ring is located at the top. When replacing the rear wear ring apply Loctite 243 to screw threads and torque to 8 Nm.

P2 Model

Removal

The rear wear ring is accessible when the low pressure impeller is removed. To remove the wear ring undo the four screws and washers retaining the ring against the high pressure cover plate. The wear ring can be eased away from the cover plate by means of two screws inserted into the adjacent tappings.

Check the wearing diameters as follows –



Pump	Ø X	Ø Y
P2_2010/3010	134.440 / 134.400	68.500 / 68.450
P2_4010	170.000 / 169.937	68.500 / 68.450
P2_6010	187.45 / 187.40	68.500 / 68.450

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Installation

When relocating the rear wear ring into the cover plate, ensure the priming port in the ring is located at the top. When replacing the rear wear ring apply Loctite 243 to screw threads and torque to 8 Nm.

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4. P2 Only - High Pressure Impeller

Removal

To access the high pressure impeller the suction tube and low pressure impeller must be removed as per sections 1 and 2.

Remove the high pressure cover plate by undoing the 12 off cap screws. Insert 3 off M8 bolts into the extractor holes around the edge of the plate. Screw the bolts in evenly until the plate moves forward.

Remove the cover plate and high pressure impeller. Clean the cover plate and pump body jointing faces.

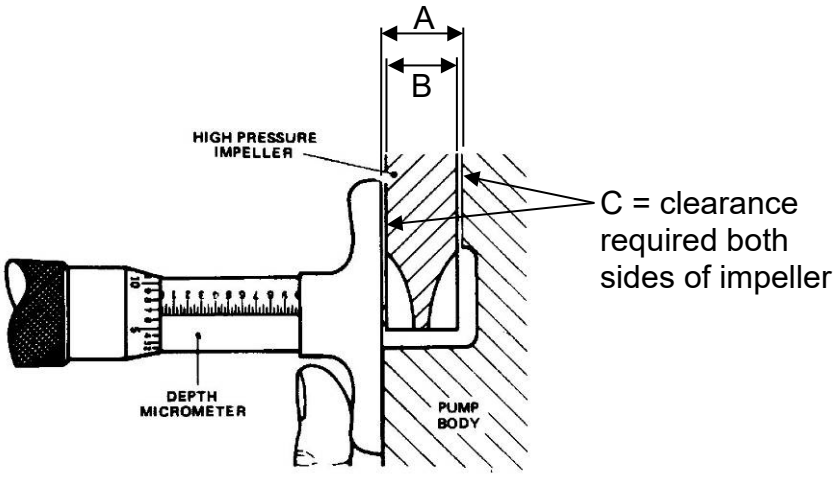
5. P2 Only - High Pressure Impeller - Maintenance

Check the high pressure impeller, pump body, mechanical seal assembly for wear. Replace any worn parts.

Installation

Replacing the high pressure impeller requires precise setting to achieve the rated output. If no new parts are fitted, the original shims as fitted to the pump may be refitted and a check on clearances carried out as detailed below.

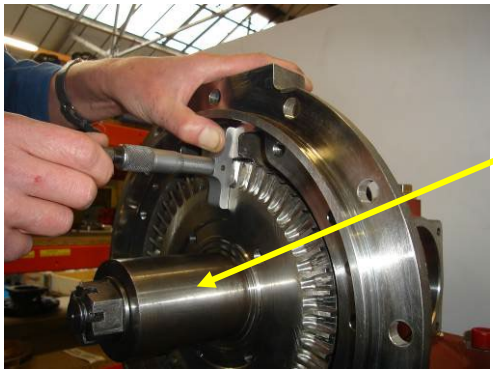
If new parts are fitted then follow this checking procedure –
Measure the depth of the high pressure counter bore in the pump body (Dimension A). Measure the thickness of the impeller (Dimension B). Required clearance C = (A-B)/2.



Place a 1.1mm shim pack made up of 60095 series shims onto the pump shaft and then fit the high pressure impeller. Place a clamping spacer over the pump shaft and securely tighten the impeller using the shaft retaining nut.

Measure the depth between the face of the impeller and the shoulder within the pump body (Dimension X). Adjust the previously fitted shim pack until Dimension X = C.

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Remove the impeller to re-fit the mechanical seal and main key on the pump shaft – if they have been removed.

Replace the high pressure impeller on the pump shaft.

Available shims for setting the high pressure impeller -

		0.0508mm /0.002”	0.127mm /0.005”	0.254mm /0.010”	0.3810mm /0.015”
Pack Thickness mm	Pack Thickness inches	Part No. 60095/01	Part No. 60095/02	Part No. 60095/03	Part No. 60095/04
0.0508	0.002	Qty 1			
0.1016	0.004	Qty 2			
0.127	0.005		Qty 1		
0.1524	0.006	Qty 3			
0.1778	0.007	Qty 1	Qty 1		
0.2032	0.008	Qty 4			
0.2286	0.009	Qty 2	Qty 1		
0.254	0.010			Qty 1	
0.2794	0.011	Qty 3	Qty 1		
0.3048	0.012	Qty 1			
0.3302	0.013	Qty 4	Qty 1		
0.355	0.014	Qty 2		Qty 1	
0.3810	0.015				Qty 1
0.4064	0.016	Qty 3		Qty 1	
0.4318	0.017	Qty 1	Qty 1	Qty 1	
0.4572	0.018	Qty 4		Qty 1	
0.4826	0.019	Qty 2			Qty 1
0.508	0.020			Qty 2	
0.5334	0.021	Qty 3			Qty 1
0.5588	0.022	Qty 1		Qty 2	
0.5842	0.023	Qty 4			Qty 1
0.6096	0.024	Qty 2		Qty 2	
0.635	0.025			Qty 1	Qty 1
0.6604	0.026	Qty 3		Qty 2	
0.6858	0.027	Qty 1	Qty 1	Qty 2	
0.7112	0.028	Qty 4		Qty 2	
0.7366	0.029	Qty 2		Qty 1	Qty 1
0.7620	0.030				Qty 2

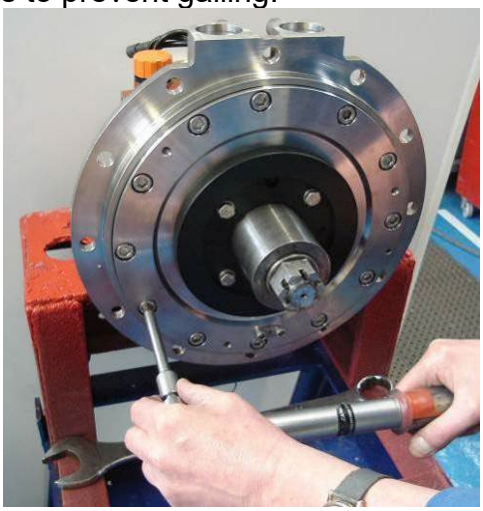
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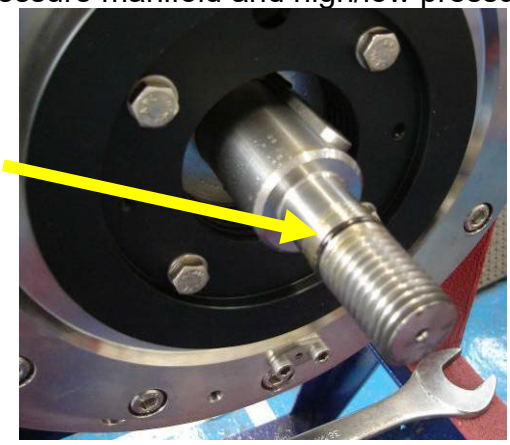
Before replacing the high pressure cover plate, ensure the auto drain ball bearing is moving freely in the high pressure drain valve. If the retaining plate does have to be removed ensure the two cap screws are secured with Loctite 243 to the threads.



Replace the high pressure cover plate against the pump body. Retain with 12 off cap screws and torque to 44 Nm. Apply Molykote P37 or similar under the head of the cap screws to prevent galling.



Place the O ring (57044) into the groove on the end of the pump shaft, and two O rings into the grooves in the transfer tube openings in the pump body ready to receive the low pressure manifold and high/low pressure filter housing.



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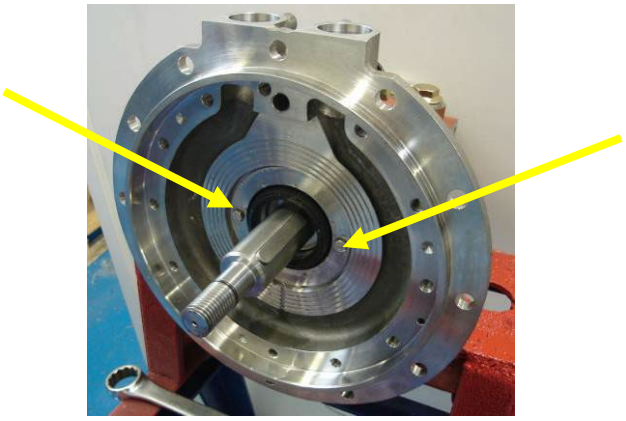
6. Mechanical Seal Maintenance

With the high pressure impeller (P2) or low pressure impeller (P1) removed the carbon seal can be examined for wear.
If there has been excessive leakage past the carbon seal and through the drain hole in the pump head, examine the carbon seal.

If the face of the carbon seal is scored, this will have to be replaced along with the mating part, the silicon carbide ring located in the rear side of the HP impeller (P2) or low pressure impeller (P1).

Removal

The carbon seal can be removed from the carrier assembly by undoing the two screws securing the assembly to the pump body. Carefully remove the carbon seal.



P2 pump body shown

The silicon carbide ring fitted in the high pressure impeller (P2) or low pressure impeller (P1) can be levered out by means of a small instrument screwdriver.

Installation

Ensure that the lapped faces are clean. Soiled faces must be cleaned with the appropriate degreasing cleaner and soft tissue.

Ensure that the pump body and high pressure impeller (P2) are clean and free from burrs and sharp edges.

Apply a suitable lubricant, e.g. soft soap solution (washing up liquid) to the O ring and carefully insert the seal assembly into the pump body, lining up the screw holes in the seal assembly with the screw holes in the pump body.

Replace the two screws and seals retaining the seal. Tighten the screws half a turn at a time so the seal assembly is pulled squarely into the pump body. Ensure the screws are fully secured.

Ensure the carbon face is clean and free from grease, if not use a degreasing cleaner and soft tissue. Apply clean water to the carbon face.

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Fit the opposite seal mating ring assembly into the high pressure impeller bore using fitting tool 60275/08. Ensure the face of the mating ring is fitted squarely in the impeller housing within 0.1mm. Use a soft soap solution on seal cup to ease fitting.

Carefully fit the high pressure impeller onto the shaft and continue with pump build.

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7. Volute Body

It is unlikely that the volute body will need to be removed during normal service. But if removal is required -

Removal

Remove the suction tube as in section 1.

The volute is mounted to the pump body by 12 off capscrews. The volute may be mounted on either standard rotation or reverse rotation pumps, and must be fitted the correct way for the rotation of the pump. The arrow cast on the volute will point in the direction of rotation.

Installation

Installation is a reversal of the removal process.

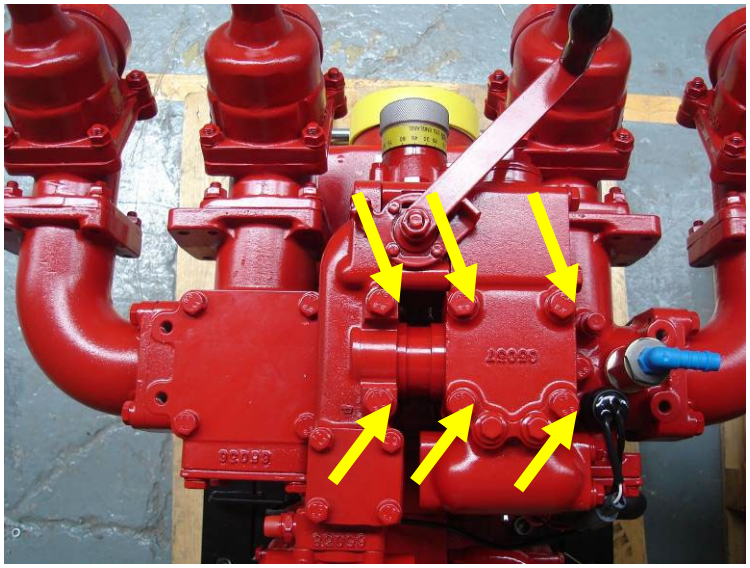
8. Low Pressure Manifold and High/Low Pressure Filter Housing (P2)

The low pressure manifold and the high/low pressure filter housing are attached to the top of the volute.

Removal – High/Low pressure Filter Housing

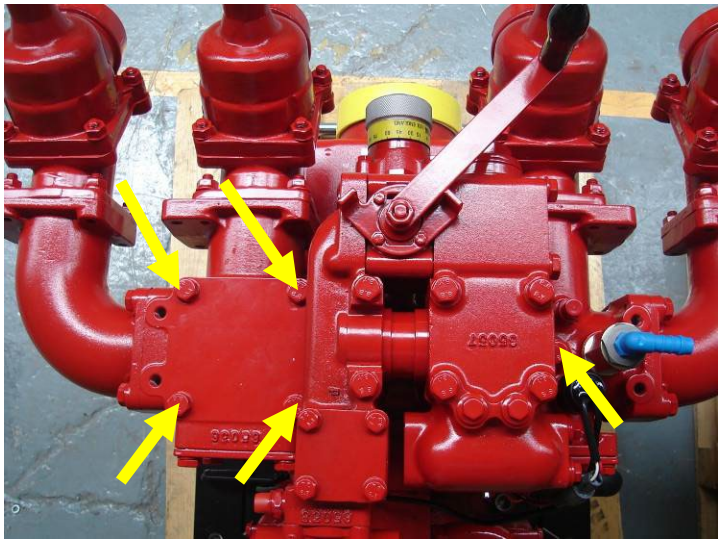
P2 only – first disconnect the high pressure pump discharge connections together with gauge, thermal relief valve and foam connections.

The high/low pressure filter housing is removed by undoing the six bolts securing the housing to the manifold below.



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Below the high/low pressure filter housing, the low pressure manifold is secured to the volute by five bolts.



The filter in the high/low pressure housing is designed to prevent large particles from entering the high pressure stage. During pump operation in low pressure mode and at any time the pressure relief valve is open, a flow of water is directed across the filter helping to flush the exterior of the filter.

The change over valve is clamped between the filter housing and the bypass connector housing and is retained by four off bolts. Also constrained between the two housings is the cylindrical pressure relief valve and sealed on its outside diameter by two O rings. This valve contains a strong internal spring and must not be stripped down. It is reinstalled with its open end towards the filter housing. It is retained by an external circlip.

Removal – Low pressure manifold

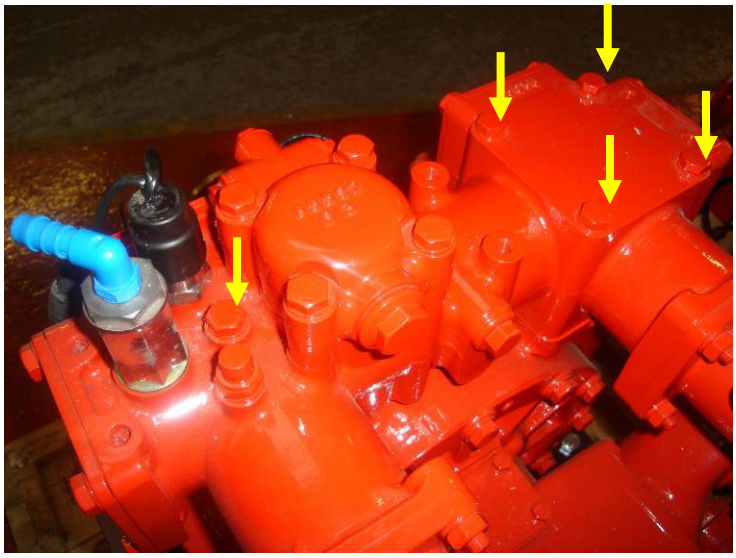
P1 only The low pressure manifold, with filter housing, is attached to the top of the volute.

Removal

To remove this entire assembly disconnect the pressure gauge connections together with any foam connection options that may be fitted.

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The low pressure manifold is secured to the volute by five bolts.



The filter on the low pressure manifold is designed to filter water that can be used for ancillary devices, e.g. gearbox cooling. The filter can be unscrewed and removed for cleaning in running water.



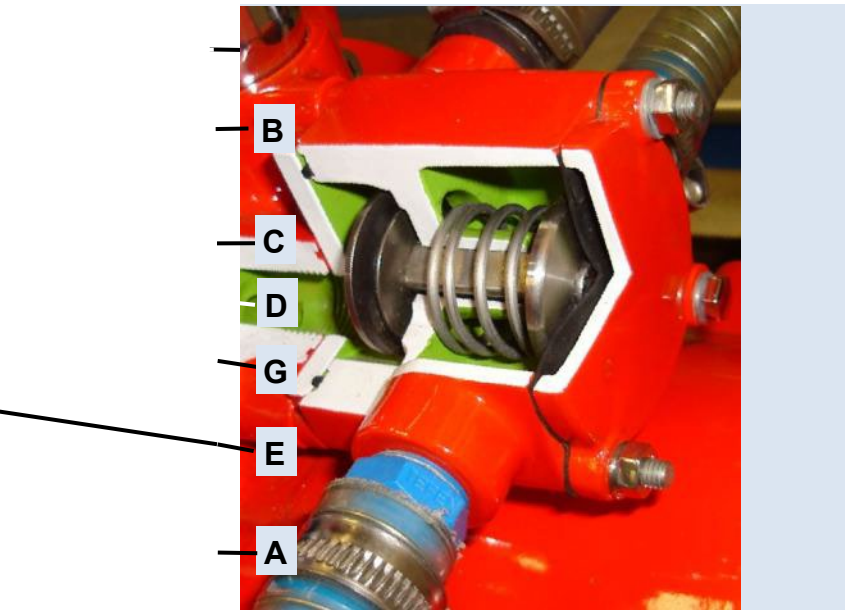
9. Priming Valve

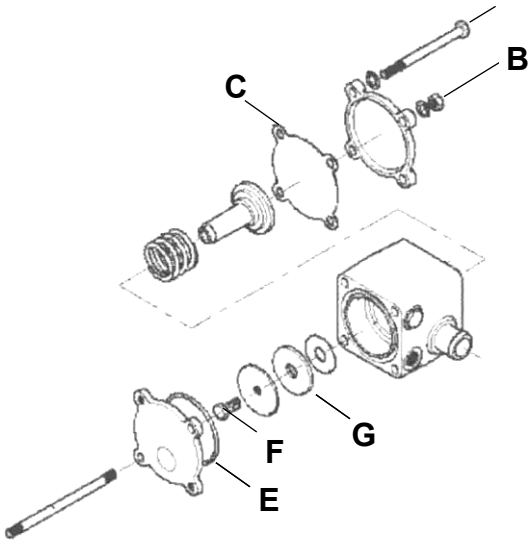
Removal

The Prima pump uses a single priming valve attached to the rear of the pump body and connected to the piston primers by two short hose lengths.

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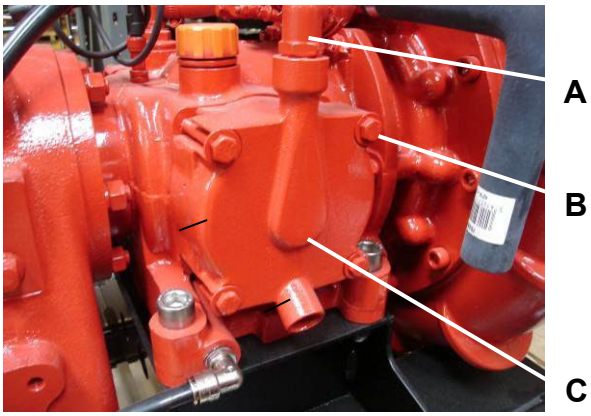
1. Disconnect the priming pipes (A) from the priming valve.
2. The priming valve can be removed from the pump as a complete assembly by undoing the nuts on the two studs (B).
3. To dismantle the priming valve undo the two bolts (D) Remove the priming valve cover and discard the diaphragm (C).
4. Remove the screw (F) from the piston and separate the piston parts. Discard the seal (G).
5. Discard the 'O' ring (E).
6. Inspect all parts for signs of wear or damage, check that they are in good condition. Replace damaged parts if necessary.
7. Assemble parts in reverse order, making sure that a new 'O' ring (E), seal (G) and diaphragm (C) are installed. Tighten bolts (D) to complete the unit.
8. Install the priming valve assembly to the pump and secure with the nuts (B) and washers.
9. Connect the priming pipes (A) to the priming valve

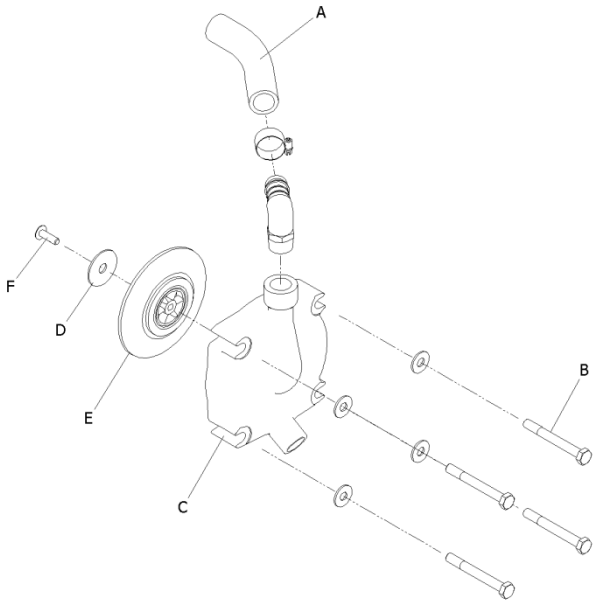
10. Primer System – Reciprocating Piston Primer

Removal / Maintenance

The reciprocating piston primer system features two identical pistons located each side of the pump shaft in the bearing housing. Both primers are connected by a flexible hose to the priming valve and through this to the suction tube.

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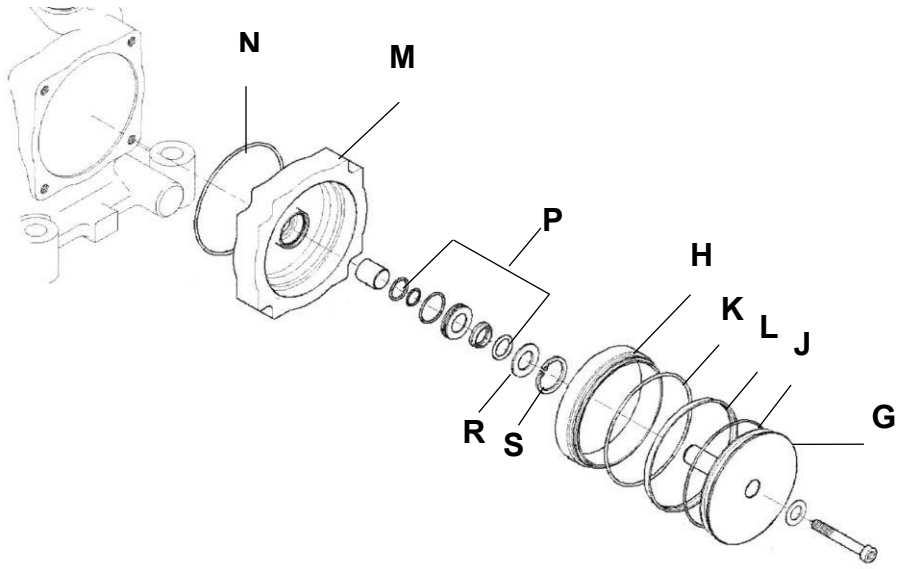


End Cover

1. Disconnect the hose (A).
2. Remove four bolts (B) and washers. Remove the cover (C).
3. The rubber inlet (D p/n 65009) and outlet (E p/n 65008/002) valves must be changed.
4. To replace the valves, remove the screw (F). Remove the valves from the cover.
5. Clean the inside of the cover.
6. Install new valves in the cover. Apply Loctite 380e to the threads of the screw (F). Avoid placing Loctite on the underside of the screw head.
7. Secure the valves with the screw.

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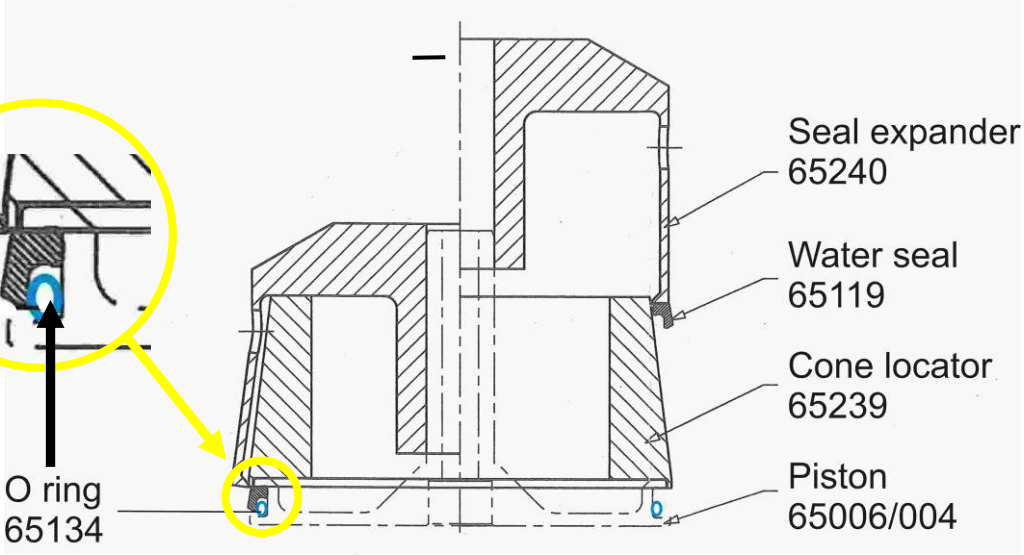
Primer Piston and Cylinder
These assemblies contain a number of seals that should be replaced.



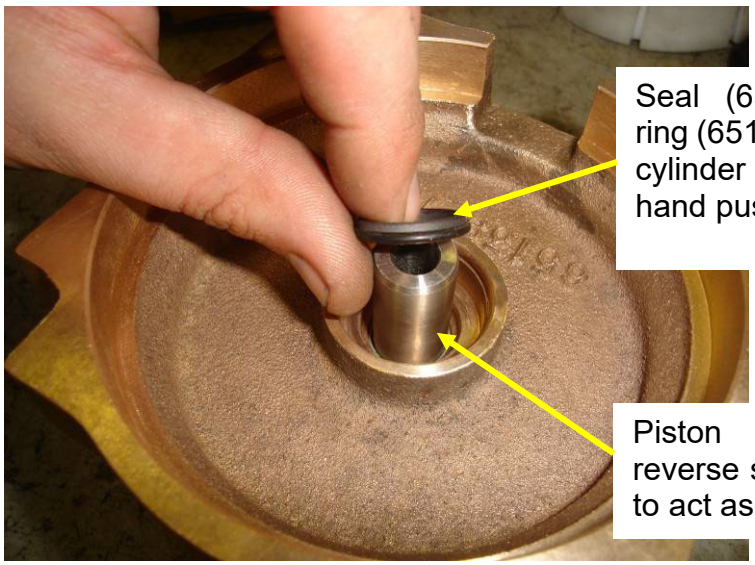
The piston (G) and cylinder liner (H) assembly comprise two ‘O’ rings (J p/n 65134) and K p/n 61097) and a water seal (L p/n 65119).

1. Replace the two ‘O’ rings and water seal.
2. The water seal and O ring are best replaced using the Godiva special tool P/n 65239/65240 Piston Seal Assembly Tool. This helps to slide the water seal over the edge of the piston.
3. O ring 65134 is placed in the groove of the piston, this is a loose fit. Cone locator 65239 sits on top of the piston, using the piston ring edge as a location guide.
4. Water seal 65119 is placed over the locator at the narrow end. The water seal is placed with the O ring groove facing downwards, so the already fitted O ring can be accommodated. A small amount of water can be used as lubrication around the seal and locator surfaces.
5. Place the seal expander 65240 over the cone with the outer edge pressing down on the water seal.
6. Press down on the seal expander to force the water seal down towards the piston groove. A final push will force the water seal into the piston groove resting on top of the O ring already in the groove.
7. The seal expander and cone locator are now removed.
8. O ring K (p/n 61097) rests in a groove on the outside of the cylinder liner H (p/n 65006/002) and can hand fitted.

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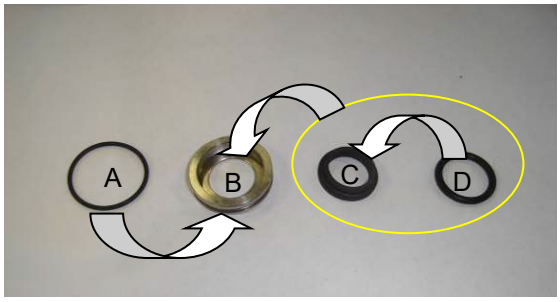
9. The cylinder body (M) assembly has an outer ‘O’ ring (N) and an inner seal arrangement (P) that comprises three ‘o’ rings, two shaft seals and a wiper carrier. These items are secured in the cylinder bore with a retaining disc (R) and circlip (S).
10. Replace O ring N (p/n 61097) on the cylinder M by pressing the O ring into the groove.
11. To replace the inner seal arrangement P a set of special tools are available to assist correct fitting.
12. First insert the seal (p/n 65159) with its O ring (p/n 65160). It is useful to use the piston shaft as a guidance tool inserted into the cylinder at the reverse side to the working position. Note how the O ring is pointing downwards when inserting in the cylinder.



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13. Next - the second group of seals (p/n 52816, 65161, 65162) can be prepared for fitting. These three parts locate onto the wiper carrier (p/n 65158/001), a component that should not need replacing.

    This picture shows how the seals assemble on the carrier.



A = O ring p/n 52816
B = Wiper carrier p/n 65158/001
C = seal p/n 65161
D = O ring p/n 65162



The complete assembly is placed in the cylinder using the piston shaft as a location guide.

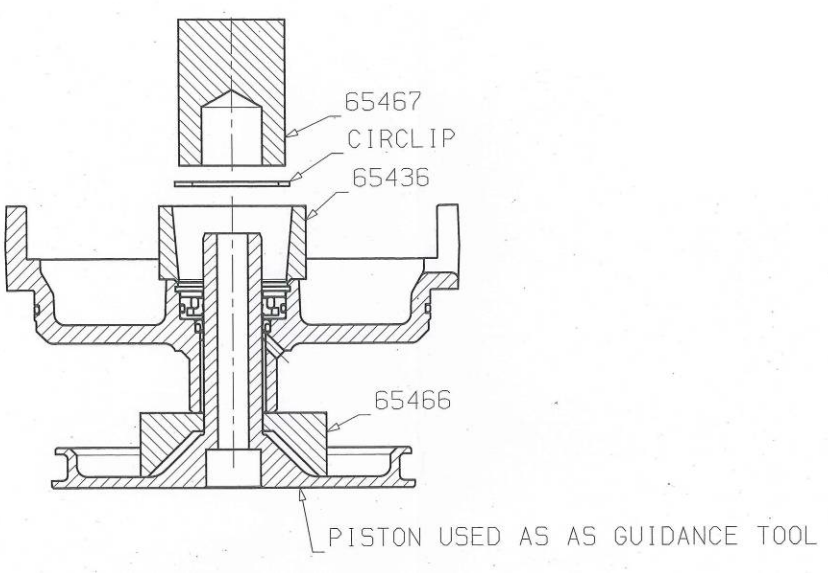
    Apply a smear of general purpose grease to the O ring A, to assist inserting the assembly into the cylinder.

14. When inserting the seal assembly into the cylinder a suitable press can be used to push the seal to the bottom of the cylinder, using the special tools and retaining disc (p/n 65157) described in section 16 – but without inserting the circlip

15. The seal assembly is retained in the cylinder body by a retaining disc and circlip.

16. To fully insert the seals and O rings use the special tools as indicated in this diagram -

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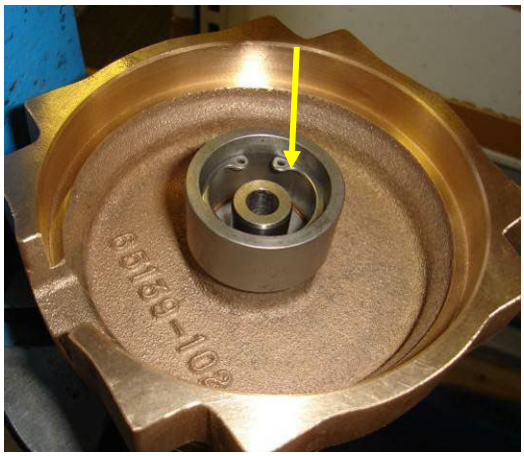


16. Cylinder support tool (p/n 65466) is used to raise the cylinder a short height.

17. Insert the retaining disc (p/n 65167) to rest on top of the previously inserted seals and O ring assemblies.

17. Place the circlip fitting tool (p/n 65436) over the end of piston shaft and resting on the cylinder casting.

18. Insert the circlip (p/n 60914) into the circlip fitting tool.





19. Place the Circlip Drift tool inside the fitting tool to rest on the circlip. By applying pressure to the fitting tool, using a suitable manual press, the circlip will be pushed down until it fits into the groove inside the cylinder liner. This secures and retains the seal assemblies, as below.

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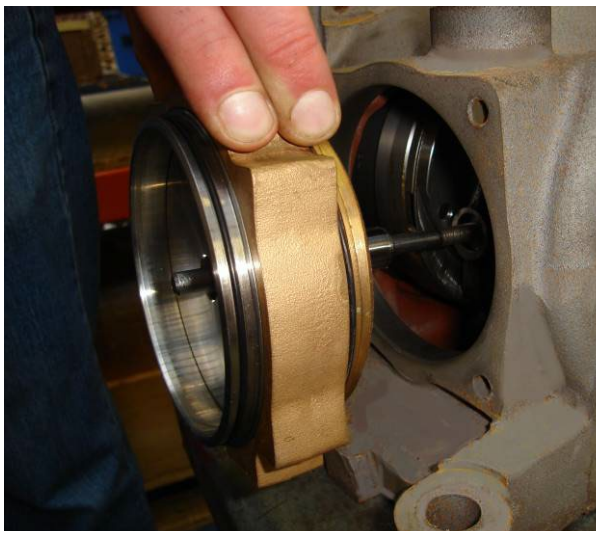


20. The piston can now be removed from the cylinder and re-assembled to the cylinder in the correct orientation. The manual press can also be used to force the piston through the seal arrangement until the piston rests in the bottom of the cylinder.

The complete assembly can now be placed back onto the bearing housing with the piston shaft placed to connect with the pump shaft yoke inside.

If only one cylinder assembly is removed for repair, the cylinder in place will maintain the position of the yoke. If both cylinders are removed, use a guide rod inserted into the yoke to help connect the yoke and the piston shaft.

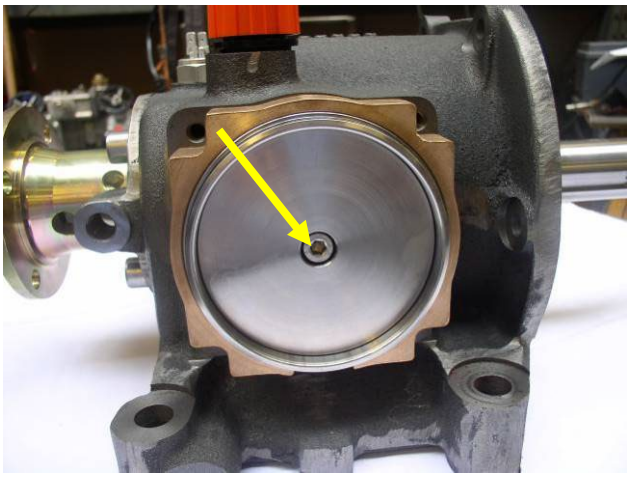




The cylinder/piston assembly will then slide over the guide rod and connect with the yoke.

The screw (p/n 65169) and bonded seal (p/n MS133/8) are inserted to secure the piston to the yoke. If the seal is being used again, apply Loctite 243 around the screw head to secure the bolt. Tighten to a torque of 20Nm.

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21. Install the priming valve cover (C) and secure with the four screws (B) and washers.

22. Connect the hose (A) to the priming valve.

11. Pump Head

The main reason for removing the pump head is to gain access to the bearing housing. But the front oil seal mounted on the bearing housing can be accessed without removing the pump head.

Removal

Remove the low pressure manifold, volute body, impellers, cover plate and mechanical seal assembly, as detailed in the previous sections.

Unscrew the six nuts and washers retaining the pump head to the bearing housing. Using a hide faced hammer, tap around the pump head until it is separated from the bearing housing.

Installation

Installation is a reversal of the removal process.

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12. Front End Oil Seal

Removal

To access the front end oil seal, remove the low pressure impeller, cover plate, high pressure impeller and mechanical seal and other relevant sections. Remove the seal housing by undoing the four cap screws.

Installation

When re-fitting, insert a new oil seal into the seal housing. Secure the seal housing with the four cap screws.

12. Rear Oil Seal

Removal

For access to the rear end shaft and oil seal it is necessary to disconnect the drive shaft from the pump drive flange and drain oil from the bearing housing.

Installation

When re-fitting, insert a new oil seal into the seal housing. Secure the seal housing with the four cap screws.

13. Bearing Housing

The following section will only be necessary if worn or damaged bearings or a faulty clutch are suspected.

Removal

Remove from the bearing housing all the assemblies mentioned in previous sections, leaving the bearing housing as a separate module. Drain the bearing housing of all oil.

Remove the front and rear oil seal housings. Lightly tap the shaft assembly with a hammer, forwards from the rear (drive flange end), the entire assembly will move forward and free of the bearing housing.

The shaft assembly can be dissembled by reversing the assembly process described below.

To remove the components on the shaft it is necessary to remove the bearing inner race (at the drive flange end). This can be removed by using a special extractor tool that grips the flinger assembly behind the bearing inner race.

IDEX FIRE SUPPRESSION GROUP

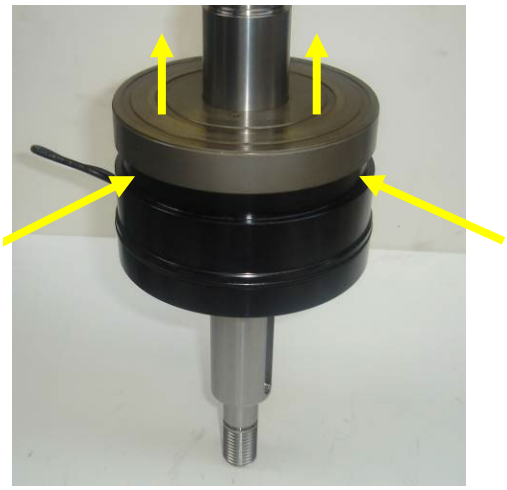
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The shaft assembly is set upright on a work bench. By turning the extractor tool the flinger assembly is moved up the shaft and the bearing inner race is pulled away from the shaft.



Note: the majority of the components will slide off the shaft (flinger assembly, shims, balance weight/sliders/yoke/eccentric assembly) but the clutch rotor/stator and two shaft bearings require careful separartion.
To remove the clutch rotor from the stator it may be necessary to lever it away from the stator with a suitable tool.

Lever here to remove clutch rotor



The clutch stator can now be forced off the shaft using a suitable press tool or tapping with a soft headed hammer around the outer edge.

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The two bearings left on the shaft will require a press tool to force the shaft away from the bearings. Support the bearings underneath and force the shaft down and away from the bearings

.



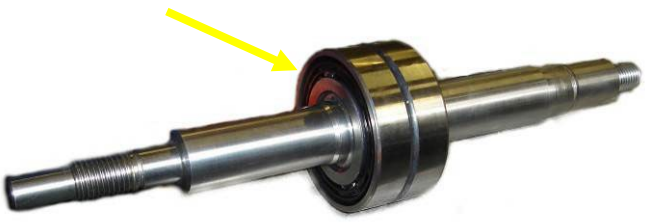
Support bearings under here in tool stand to allow shaft to be forced through

This action will complete the stripping down of the shaft assembly.

Rebuild / Installation

A new shaft assembly is constructed by following these procedures –

Press two bearings (p/n 60002) onto the shaft. Apply tallow to shaft to ease assembly. The bearings should be fitted with the large inner race facing outwards from the bearing pair.



Place the clutch stator on a suitable support and lower the shaft and bearing assembly into it.

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Fit the lip seal (p/n 60012) into the seal housing (p/n 65019/001).
Place the O ring (p/n 65171) on the seal housing.

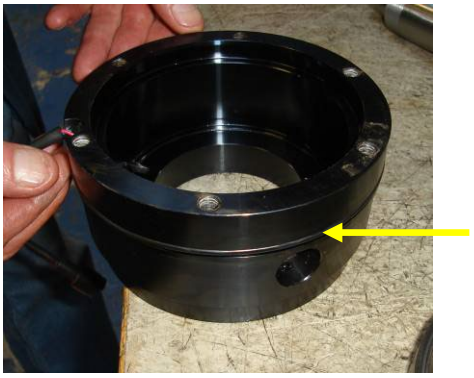


Secure the seal housing to the clutch stator with 6 off MS164/20 screws. Apply Loctite 243 to the threads and torque to 20Nm.



Fit the 53526 ‘O’ ring onto the outside of 65017/004 clutch stator.

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Place a 51355 ‘O’ ring into the 60141 seal wear ring. Smear grease between the lips of the lip seal and insert the wear ring onto the shaft and into the lip seal.



Place the shaft assembly in a locking device so that the drive end of the shaft is uppermost.

Place the MS79/44 key into the shaft.



Place the clutch stator over the shaft, locating on the previously fitted key.

Place the clutch rotor onto the shaft to rest on top of the previously installed stator.

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There are two types of clutch rotor fixing onto the shaft –
1. Early models - with Loctite 638
2. Later models - press fit (no Loctite)

1. Using Loctite 638
Apply Loctite 638 sparingly to the outer surface of the shaft, keep the Loctite away from the bearing below.



Also apply Loctite 638 sparingly to the inner surface of the rotor.



Place the rotor onto the shaft, aligning correctly with the shaft key, and press it down until it rests firmly on the stator below. Allow Loctite to set.



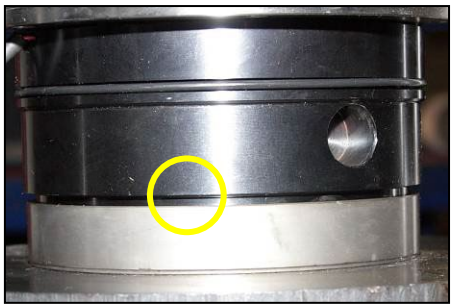
2. Later model clutch units are held in position by pressing onto the shaft. Loctite is not required.

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Turn the assembly over 180° and into a suitable press plate hole.



Press down on the shaft (low force of 20kN) until the stator is fully home.



Using a suitable press tool insert the 56949/008 DU bush into the 65021/005 eccentric drive. The bush should be pushed through the balance weight so it is slightly below or flush with the rear face.



DU bearing slightly below rear face of eccentric drive



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Secure the clutch friction plate (part of 65017/004) to the eccentric drive using the (3) screws and washers supplied by clutch manufacturer. Apply Loctite 243 to the threads, Tighten to a torque of 28Nm.

Then measure the distance between the surface of the friction plate and the lower surface of the eccentric drive. The measurement will be approximately 4.0 – 4.1mm. Note this measurement.



A gap of 0.24/0.40mm is required between the clutch rotor and friction plate. Selection of an appropriate shim from the table at the end of this section will give the required gap. E.g. gap is 4.1mm, add .3mm for the gap, therefore a shim of 4.4mm is required. A shim of 4.4mm is green coded. See table on page 42.



The previously assembled eccentric drive and friction plate can now be lowered over the shaft onto the clutch rotor face. Check the gap between the friction plate and rotor, it should be 0.3mm.



Next proceed to add the slider bush, yoke and balance weight components.

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Place the first slider bush onto the shaft with the flat surface downwards.



Place the yoke over the slider bush with the straight sides in line.



Place the second slider bush over the yoke with the straight sides in line.



Place the balance weight over the second slider bush and secure it to the eccentric drive below using two socket head screws.

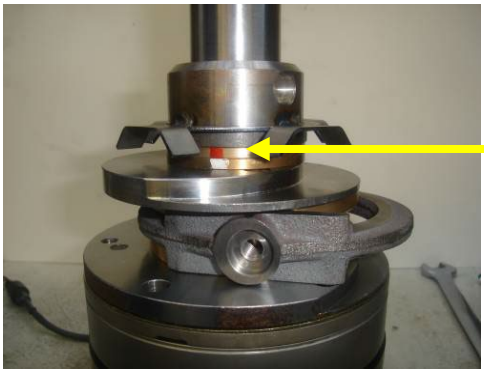
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Now measure the distance between the top surface of the balance weight and the shoulder on the shaft just above. Record this measurement. Deduct 0.1mm from this measurement to give the shim pack size required.
E.g Measurement is 8.4mm, minus 0.1mm, equals a shim pack of 8.3mm.
See table on page 42.



Place shims on the shaft equivalent to 8.3mm. The table on page 42 provides the shim options. Place the flinger assembly onto the shims and check the gap between the top shim and the flinger, gap required is 0.05-0.15mm.



Using a suitable power supply (12V or 24V DC as appropriate), power up the electromagnetic clutch to confirm activation, and ensure that the clutch assembly can't be rotated on the shaft. This confirms the presence of the MS79/44 key and clutch operation.

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The shaft assembly is now ready to be loaded into the bearing housing

Ensure that the yoke is positioned on the pump shaft assembly at mid stroke position. This eases assembly of the shaft assembly into the bearing housing.

Load the shaft assembly into the bearing housing ensuring that the wire for the electromagnetic clutch aligns with the slot in the face of the bearing housing.

Place the 60007 rear bearing outer race into the back end of the bearing housing to help support the shaft.

Secure the 65019/001 seal housing to the 65000/300 bearing housing using (6) MS164/20 cap screws, apply Loctite 243 to the threads torque to 20Nm.

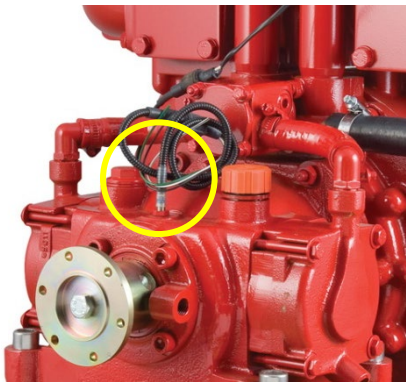
Fit the 53384/01 ‘O-ring onto the shaft underneath the rear oil seal wearing 60008.

Fit the 50682/02 oil seal into the 65094 seal housing.

Put the previously assembled 65094 seal housing on to the rear of the bearing housing and loosely locate with (4) MS166/25 screws.

Fit the 60008 rear oil sealing wearing to centralise the rear seal housing and tighten the (4) MS166/25 screws.

Tachometer Sender
If the Tachometer Sender 60015/001 located on the bearing housing needs to be replaced, please note the following -



It requires a tightening torque of 3.0Nm when fitting the sender to the bearing housing.

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Bearing Housing - Shim Details

Two sections on the shaft require shims.

1. Select shim spacer to give 0.24 / 0.40mm air gap on clutch – between friction plate and clutch rotor.

2. Select shim spacer/s to give 0.05/0.15mm gap between balance weight and flinger assembly to give minimum clearance for free rotation.

SHIM SPACER COMBINATION

	4.0	4.1	4.2	4.3	4.4	4.5	5.1
PACK THICKNESS	PART No 65166	PART No 65166/001	PART No 65166/002	PART No 65166/003	PART No 65166/004	PART No 65166/005	PART No 65166/006
COLOUR	BLACK	WHITE	RED	BLUE	GREEN	YELLOW	ORANGE
8.0	QTY 2						
8.1	QTY 1	QTY 1					
8.2	QTY 1		QTY 1				
8.3	QTY 1			QTY 1			
8.4	QTY 1				QTY 1		
8.5	QTY 1					QTY 1	
8.6				QTY 2			
8.7				QTY 1	QTY 1		
8.8				QTY 1		QTY 1	
8.9					QTY 1	QTY 1	
9.0						QTY 2	
9.1	QTY 1						QTY 1
9.2		QTY 1					QTY 1
9.3			QTY 1				QTY 1
9.4				QTY 1			QTY 1
9.5					QTY 1		QTY 1
9.6						QTY 1	QTY 1

ALTERNATIVE COMBINATION

	4.1	4.2	4.3	4.4	4.5
PACK THICKNESS	PART No 65166/001	PART No 65166/002	PART No 65166/003	PART No 65166/004	PART No 65166/005
COLOUR	WHITE	RED	BLUE	GREEN	YELLOW
8.2	QTY 2				
8.3	QTY 1	QTY 1			
8.4	QTY 1		QTY 1		
8.5	QTY 1			QTY 1	
8.6	QTY 1				QTY 1
8.7		QTY 1			QTY 1
8.8				QTY 2	

ALTERNATIVE COMBINATION

	4.2	4.3
PACK THICKNESS	PART No 65166/002	PART No 65166/003
COLOUR	RED	BLUE
8.4	QTY 2	
8.5	QTY 1	QTY 1

IDEX FIRE SUPPRESSION GROUP

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14. Gearbox (Optional)

The gearbox incorporates a cooling system, which utilises cold water diverted from the main pump body to flow around the gearbox outer housing and then return to the pump. The water is always flowing around the gearbox whenever the pump is operating and pumping water. This section describes the gearbox when it is in a vertical position in relation to the pump body, other positions are possible.

The gearbox incorporates an oil filling point , an oil level check point and an oil drain point for the routine maintenance of the unit. These points are duplicated on both sides of the gearbox to allow for different installation arrangements. There is also an oil drain point at the front of the mounting platform, if a platform is fitted.

The oil capacity of the gearbox is approximately 1.2 litres. The photograph below shows the left side of the gearbox as viewed from the PTO end.



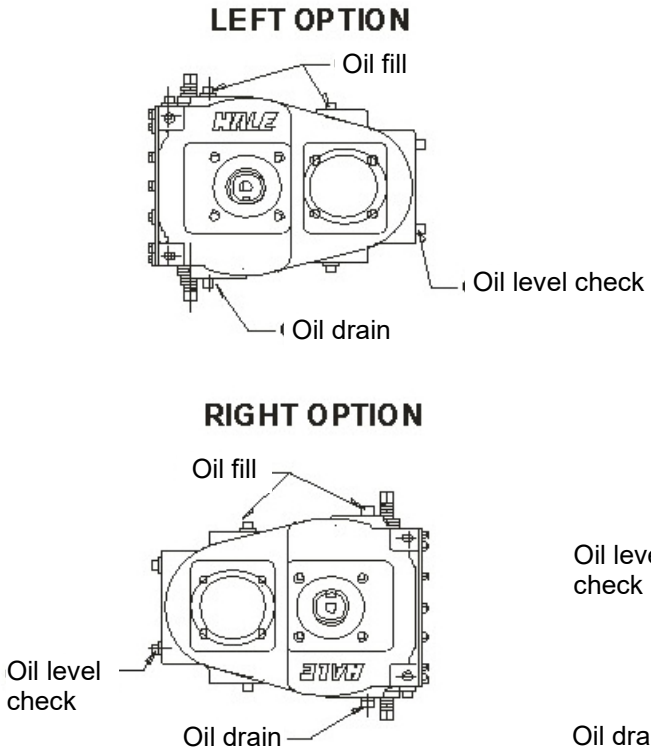
The gearbox must be filled with approximately 1.2 litres of the recommended oil before any operation commences. The recommended oil is BP Energol GR XP 68. If this is not available, the following may be used – Elf Reductelf SP 68, Shell Omala 68 or equivalent.

Undo the oil filling and level check plugs with a suitable spanner. Ensure no dust or debris enters the gearbox when the plug is removed. Using a funnel, pour the oil into the gearbox housing until it overflows from the check level plug. Before replacing the plugs, apply Loctite 572 to the plug threads to ensure a good seal, replace and hand tighten with a suitable spanner.

The oil level can be checked by removing one of the oil level check point plugs, located on both sides of the gearbox, see the photograph above. The oil should be just up to the lower rim of the hole, which indicates the capacity is approximately 1.2 litres. This is the only accurate method of checking the oil level as it allows for different size gear ratios.
Before replacing the plug, apply Loctite 572 to the plug thread to ensure a good seal, replace and hand tighten with a suitable spanner.

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The gearbox oil should be changed completely every 250 running hours or annually, whichever is sooner.



These diagrams show the oil fill points, oil level check points and oil drain points for the gearbox in the three different positions available – down, left or right.

The gearbox cooling system requires no regular maintenance. If the pump needs to be drained for any reason, there is a drain located at the lowest point in the cooling system. To drain the system, either remove the plug, or, if connected to a remote drain, open the remote drain cock. Allow all water to completely drain away before replacing the plug or closing the remote drain cock.
Before replacing the drain plug, apply Loctite 572 to the plug thread to ensure a good seal, replace and hand tighten with a suitable spanner.

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15. Water Ring Primer (Optional)

The Water Ring Primer is available as an alternative to the Piston Primer system. It is mounted above the bearing housing and driven by a fibre wheel (47) in contact with a pulley at the end of the main pump shaft. Operation of the Water Ring Primer is fully automatic, when the pump is started the primer is driven by the pulley wheel turning the fibre wheel, air is evacuated from the pump allowing water to enter and build water pressure inside the volute. The water pressure inside the pump is then used, via the redundant piston primer housing, to act on a lever which pivots, and through a second lever (61), lifts the Water Ring Primer clear of the drive pulley on the pump shaft. When the primer disengages from the pulley it stops operating, if the pump pressure falls e.g. when the pump is turned off, the primer fibre wheel will re-engage with the pulley ready for priming operation when the pump is started again.

To Remove

To remove the entire Water Ring Primer unit, slacken the hose clip (19) retaining the 3/4inch hose to the top of the primer. Disconnect the hose and secure the hose end away from the primer. Disconnect and remove the primer return spring (62) from the lower part of the primer. If connected, remove the air outlet connection from the top and the water inlet connection from the bottom of the primer. Slacken the two screws (79, 80) securing the primer to the hinge pin (69). Carefully ease the primer unit off the primer hinge pin.

Maintenance

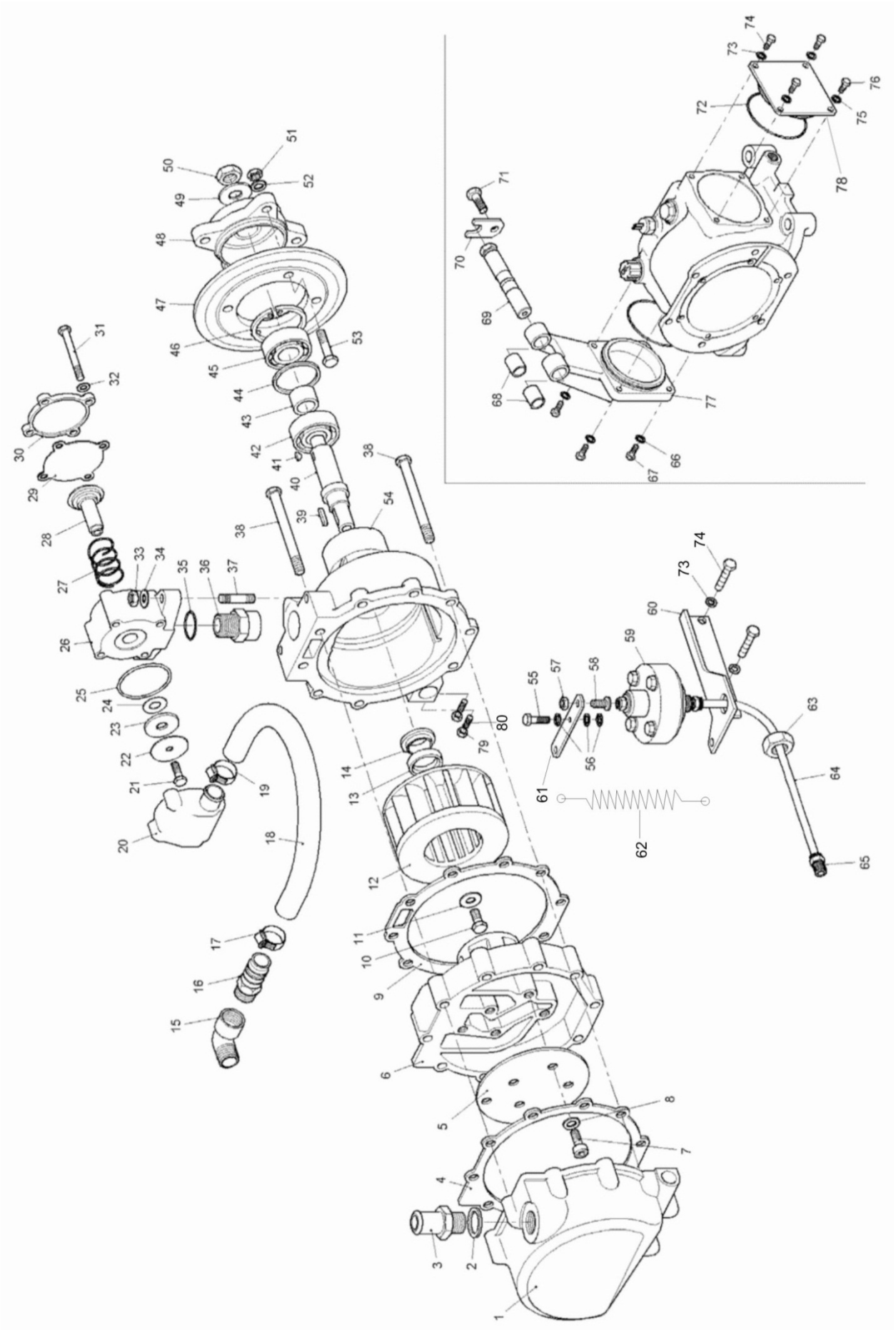
To dismantle the primer for internal inspection, remove the 10 bolts (38) securing the primer bearing housing (54) to the primer body (1). Remove the primer bearing housing complete with shaft, bearings, impeller and pulley. Examine the inner diameter of the impeller (12) and the corresponding surface of the suction and delivery cover (6) for excessive scoring, renewing these parts if necessary.

To fit a new suction and delivery cover (6), remove the self-locking screws (7) which secure the cover plate (5) to the suction and delivery cover (6). Fit this cover plate to the new part, noting that no gasket is used but jointing compound should be used on the contacting faces.

To fit a new impeller (12), undo the impeller retaining screw (10) and pull off the impeller.
Note: if the impeller binds on the shaft it will be necessary to remove the primer shaft as follows -
At the pulley end of the shaft, knock back the tabwasher (49) and remove the nut (50) securing the pulley to the shaft. Remove the pulley and extract the woodruff key (41) and the circlip (46). Tap out the shaft (40) from the impeller end. The shaft will bring the bearings (42, 45) with it and these can now be replaced if necessary. The shaft seal (13) will remain in position and if this requires renewing it should be drifted out, together with its backing washer (14), towards the impeller end.

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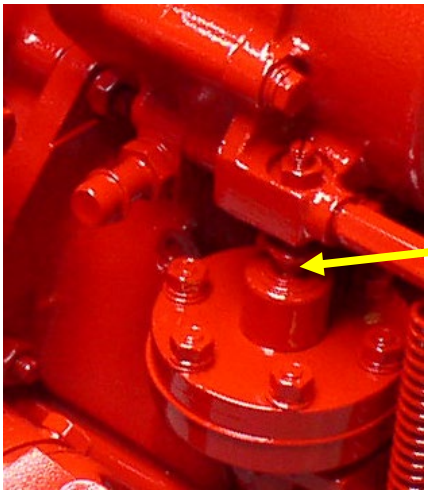
When fitting a new seal ensure that the lip on the backing washer and the open end of the seal face is towards the impeller.

To fit a new friction drive pulley (47), remove the pulley from the shaft as detailed above, undo the four nuts, bolts and washers (51, 52, 53) securing the pulley to the centre piece. Fit the new pulley. Refitting of the pulley assembly is a reversal of the dismantling instructions. Ensure that a new tab washer (49) is always used on re-assembly.

To examine the non-return valve on top of the primer, undo the four bolts and washers retaining the priming valve inlet (20) to the valve body (26) and cover (30). Examine the seals (23, 25), spring (27) and diaphragm (30) for wear, if necessary replace these parts.

To Refit

When refitting the water ring primer, rotate the primer hinge pin from its original position so that the two screws (80) will bear on a different part of the shaft. Move the whole primer forwards or backwards until both sides of the primer fibre wheel bear equally on the sides of the driving pulley on the pump shaft. Tighten the screws and the associated locknuts. Reconnect the hoses to the relevant points and refit the primer return spring.
When the primer is in position it is important to set a 3mm gap between the bottom of the lift-off pad (58) attached to the primer and the lift-off rod which is used to lift the primer away from the drive pulley. The gap is to make allowances for a new fibre drive wheel to “bed-in” through initial wear, but still maintain sufficient distance to allow the lift-off mechanism to work correctly. The lift-off pad can be turned to move it up or down as required.



When water ring primer is in engaged position (fibre pulley is resting in drive flange) there must be 3mm gap between lift-off pad on primer and cylinder piston below.

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16. Pump Tests

Vacuum Test

Place the blanking cap(s) in position on the inlet(s) of the pump and close the delivery valves. Run the pump at 1300-1500 rpm and observe the vacuum/compound needle. When a vacuum of 0.81bar is obtained, stop the pump. This vacuum should be maintained for at least 15 seconds or drop no more than 0.07bar in a minute.

If the pump will not hold the vacuum with the blanking caps in position, a leak is present in the pump, and the pressure test detailed below must be carried out to trace it.
Should the pump not reach a vacuum of 0.81bar but will hold a lower pressure, a fault in the priming system is indicated.

Pressure Test

This test is to be carried out if the pump will not hold a vacuum with blanking cap(s) in position, and is intended to trace the leaks responsible for the loss of vacuum.
Apply a water pressure of 3.5 - 7.0 bar to the pump and check for leaks. The area causing the leak should be visible, and can be dismantled and rectified.
Check each primer drain hole for water leakage. If leakage is found, replace the primer seals and O rings as described in the Maintenance Manual Procedures.
If the pump will not achieve 0.81 bar vacuum, and will not hold what it does achieve, there is a leak, and possibly also a fault, in the priming system.

If no leaks are apparent, the leakage must lie between the priming valve and the primer. Points to be checked are:
The inlet seal in the primer end cap
The priming valve diaphragm

Water Ring Primer (optional priming system)

If a water ring primer is fitted carry out the same vacuum test as described above but run the pump at 2300rpm to achieve a vacuum.
Should the pump not reach a vacuum of 0.78bar but will hold a lower pressure, a fault in the priming system is indicated. Check as follows –

See that the primer drive (fibre pulley) is engaged with the pump pulley and runs without slipping
Check that the primer is filled with water
Check the primer seal drain hole for leakage. If leakage is found, fit a new seal to the primer.

If the pump will not hold a vacuum apply the pressure test (as above) and check for leaks. Defective joints and seals must be replaced. If no leaks are apparent, the leakage must be in the line from form the priming valve to the water ring primer, points to be checked are the priming valve sealing washer, the water ring primer non-return valve and the rubber hose and clip.

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Pressure Relief Valve (PRV) and Thermal Relief Valve (TRV) Test

With the pump primed, and HP operation selected, close all discharges. Run the pump at approximately 2800rpm. The HP stage pressure should not exceed 50bar if the PRV is working satisfactorily.

Continue running the pump, to permit it to heat up. The TRV should open and discharge water when the pump temperature is about 48°C (for a Standard 42°C TRV, for a 74°C it will open about 80°) . Observe the discharge, if it open to atmosphere, or feel the discharge pipe become warm if it returns to the vehicle tank. Open a pump discharge valve to permit cool water to enter the pump. The flow from the TRV should now cease.
If the TRV is not operating as it should follow this procedure –

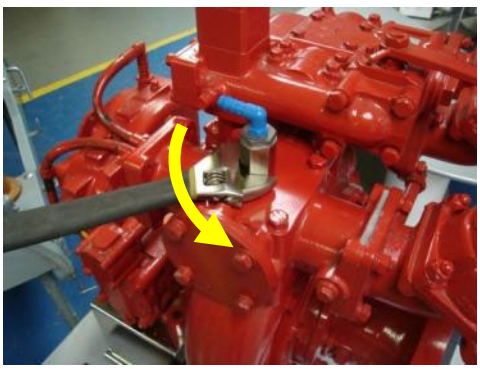
Thermal Relief Valve Maintenance

The Thermal Relief Valve (TRV) fitted usually requires minimum maintenance attention, but should the valve be failing to open at the specified temperature or remaining open after the water temperature has lowered, follow these instructions to clean the valve.

1. Location. The TRV is located on the top surface of the discharge manifold –



2. Remove the TRV with a suitable adjustable spanner to grip the main TRV body.



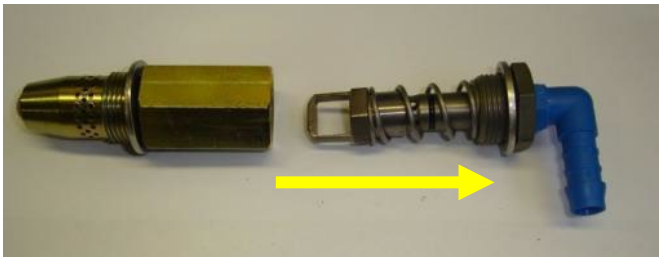
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3. Remove the internal parts from the outer housing. Secure the TRV vertically in a vice. With an adjustable spanner undo the top part of the TRV.



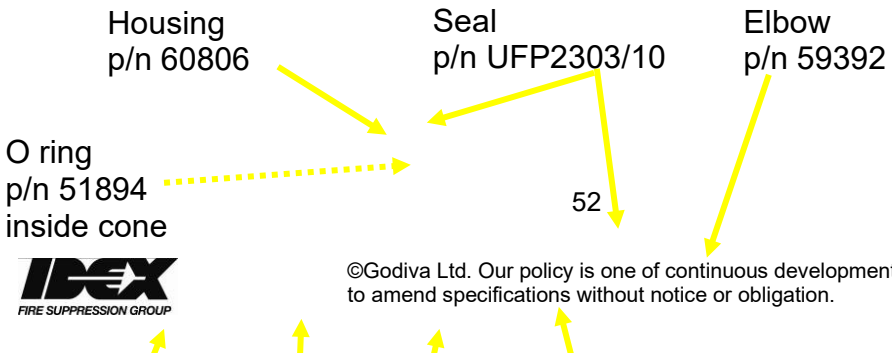
4. The TRV internal parts will now slide out of the housing



5. The thermal actuator (p/n 57053) can now be pushed out of the main housing from the cone end for inspection



6. All the main internal parts can now be inspected for wear and/or the build-up of mineral deposits.
If there is significant deposit build-up, this can be removed by cleaning the outer housing and internal parts in a proprietary lime scale remover.



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Build-up of deposit, usually due to high concentration of mineral deposits in water

thermal actuator p/n 57053 | sleeve p/n 60808 | spring p/n 670715 | O ring p/n 58107 | outlet adaptor p/n 60807

Faulty operation could be due to the sleeve (p/n 60808) sticking in a closed or open position on the outlet adaptor (p/n 60807). Also, if the O rings (p/n 58107) are worn or damaged there will be an inadequate seal allowing water to discharge unnecessarily.

7. Re-assembly is a reversal of the dismantling process. If new O rings (p/n 58107) are to be fitted, roll the first O ring into the lower groove on the outlet adaptor, then roll the second O ring over the first O ring in to the second groove higher up the adaptor. Apply water resistant grease to the new O rings and the grooves to facilitate fitting.

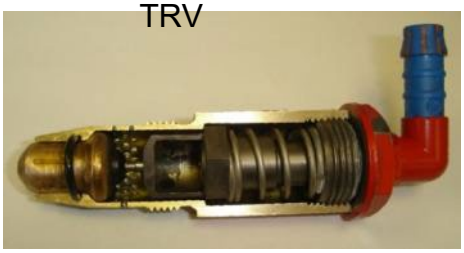
NB: Service Parts Required – Seal, UFP2303/10, 1 off. O ring, 58107, 2 off.

Fit this O ring first

Fit this O ring second



Cross section of assembled TRV



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Suction Pressure Relief Valve Maintenance

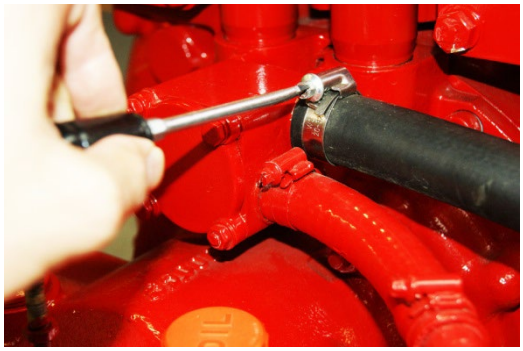
The Suction Pressure Relief Valve (SPRV, p/n 60388) is fitted to the Prima multi-pressure pump. We recommend that the SPRV is checked for correct operation every 12 months, regardless of the amount of pump use.

The valve is designed to protect the main parts of the pump from a sudden build-up of internal pressure from the closing of HP discharge hoses at the nozzle end. The valve will open at 13 Bar to allow the discharge of a small amount of pressurised water and close when the pressure drops below this point. The valve is pre-set at the factory to open at 13 Bar and we recommend that valves failing to meet this specification are replaced as a unit.

Follow this procedure for checking the valve, especially the valve spring - IMPORTANT: Ensure the pump PTO is disengaged and the pump is drained before proceeding.



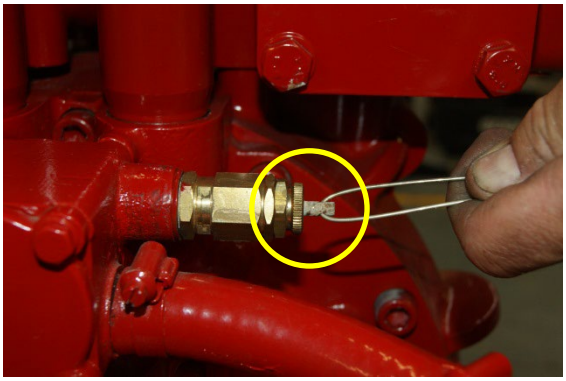
1. Remove the rubber discharge pipe by undoing the hose clip.



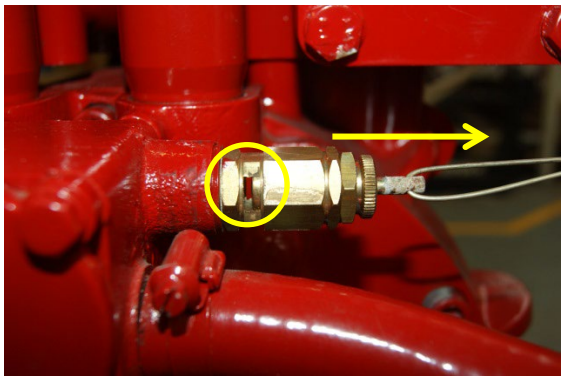
2. Insert a wire through the hole on the end of the valve. The wire must be sufficiently strong to pull against the internal spring of the valve.

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3. If the valve is functioning correctly and free of corrosion, the valve can be pulled outward against the spring - by approximately 3mm and will re-seat when released.
Notice the aperture opening on the left of the valve in this picture. This is where the pressurised water will discharge through if it reaches 13 bar or more.



4. If the valve spring is not corroded and functioning correctly it will look like this photograph. There is a small hole in the side of the valve to observe the condition of the spring.



5. A corroded valve spring will look similar to this photograph. If the valve is sticking or the spring corroded, it is necessary to replace the valve completely. Unscrew the valve from the pump and insert a new one - part number 60388.

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Replace the rubber discharge elbow over the valve and secure with the hose clip.

Run the pump and check for leaks. One method of doing this is to feed water from a hydrant at 10 Bar pressure.

Then run a vacuum test, see the relevant Godiva pump manual for details.
If the SPRV passes these tests the pump can be returned to operation.
If there is any uncertainty about the operation of the SPRV, please call Godiva, or our agent.

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17. Delivery Valves

Ball Valve Type

The ball valve should not be dismantled unless it is functioning unsatisfactorily. There are two possible faults and the method of correcting them is as follows:

1. *Water leaking round the ball*

This is due to the O Ring not pressing tightly enough against the ball. Remove the bolts and spring washers and separate the coupling end tube from the ball valve housing. Turn the O Ring over so that it presents a new face to the Ball Valve, or fit a new O Ring. Rub a little Molybdenum Disulphide Powder into the surface of the ball where it contacts the O Ring. Leave the original washers or the same thickness of new washers, between the faces of the coupling end tube and the valve housing.

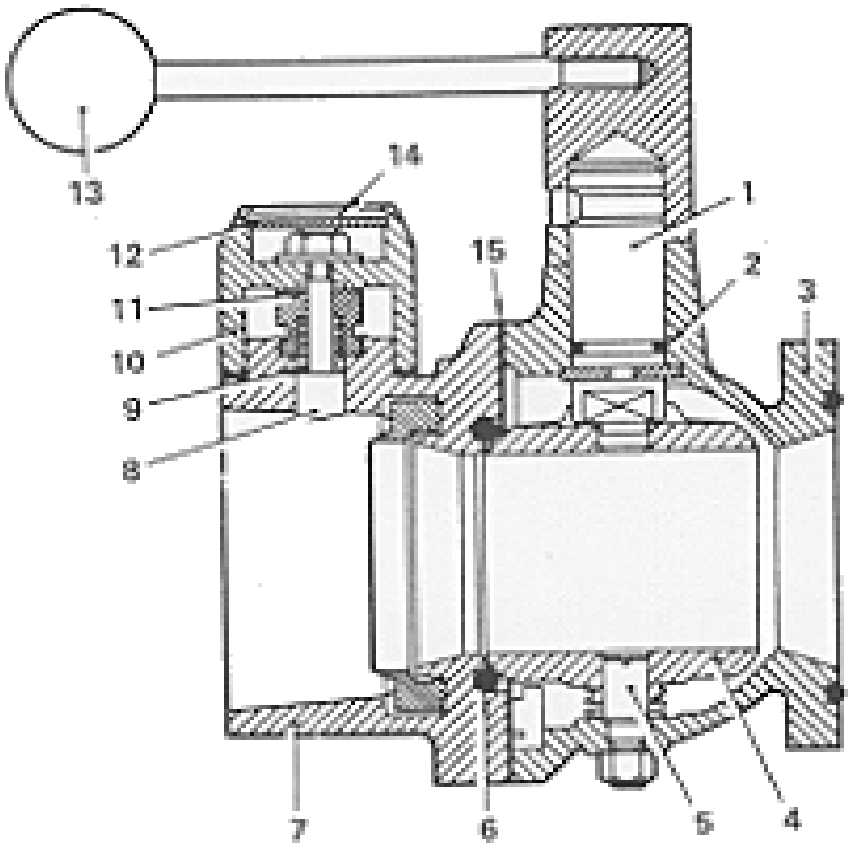
In the case of old valves which have seen extremely arduous service, it may be necessary to fit a new ball, pivot or valve stem. To do this, remove the screw securing the valve stem cap to the ball valve housing and lift off the handle assembly.

Remove the nut on the underside of the valve housing and push the ball pivot pin towards the centre of the ball. Remove the spring and take out the two half-rings securing the valve stem. Push out the valve stem and withdraw the ball. Fit the new part required and reassemble, reversing the above procedure. Use a right angled screwdriver to hold the pivot pin when tightening the pivot pin nut. Ensure that the handle is fitted in the correct position. Fit the stem O Ring and ensure that the two half rings are correctly positioned.

2. *Water leaking up the valve stem*

If this occurs, remove the handle and stem as in "1" above and fit a new valve stem O Ring, rubbing a little molybdenum Disulphide Powder into the bore of the valve stem cap.

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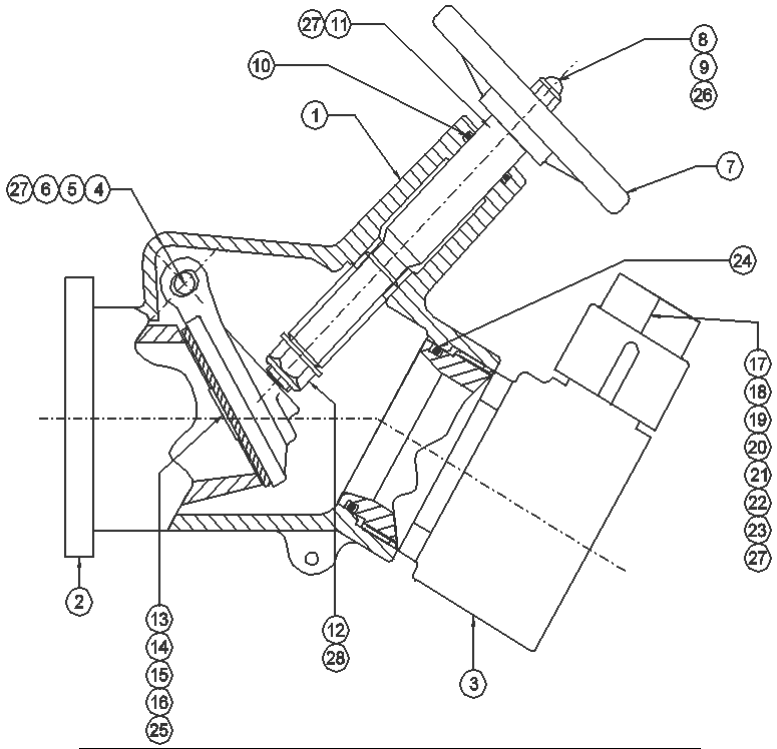
1	Valve Stem	9	Spring
2	Valve Stem Seal	10	Coupling Release Cap
3	Valve Housing	11	Release Cam
4	Ball Valve	12	Closure Disc
5	Ball pivot and Spring	13	Operating Handle
6	O Ring	14	Circlip
7	Coupling End Tube	15	Joint Washers
8	Coupling Release Bolt		

Part Nos	**Light Alloy I/C**	**Gunmetal I/C**
LH	TH137	TH153/100
RH	TH138	TH154/100

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Screw-down Type

Godiva Part Number 56544/01 Light Alloy and 56544/05 Gunmetal (Instantaneous Connector Versions)



ITEM	DESCRIPTION	QTY.
1	Main Body	N/A
2	Inlet	N/A
3	Outlet	1
4	Pivot Pin	1
5	'O' Ring	2
6	Circlip	2
7	Screw Down Handle	1
8	Domed Nut	1
9	Spring Washer	1
10	'O' Ring	1
11	Screw Down Spindle	1
12	M12 Stainless Steel Washer	1
13	Non Return Flap	1
14	Non Return Flap Washer	1
15	Retaining Washer	1
16	Washer Insert	2
17	Instantaneous Washer	1
18	Twist Release Knob	1
19	Release Cam	1
20	Release Spring	1
21	Release Plunger	1
22	Knob Closure Bung	1
23	Nyloc Nut	1
24	'O' Ring	1
25	'C' Sunk Screw	2
26	Plain Washer	1
27	Moly Grease	1
28	M12 Stainless Steel Nyloc Nut	1

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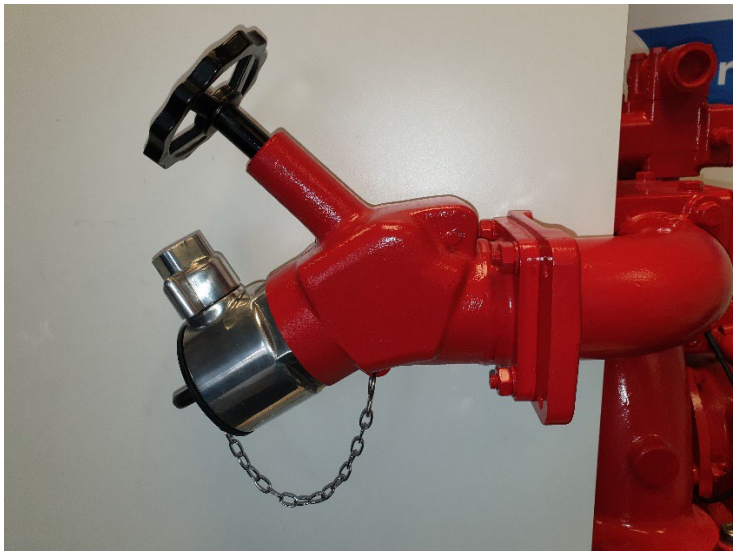
Inspection and Maintenance

1. After each use -
Check that the valve opens and closes freely without the need to exert excessive torque to the handwheel. Do not overtighten in either direction. If stiff, dismantle the spindle and investigate.
Check that there are no leaks around the spindle. If leaking, change O ring (9).
Check that the twist release mechanism operates freely and that the female instantaneous seal is in place.
Check visually for any damage.

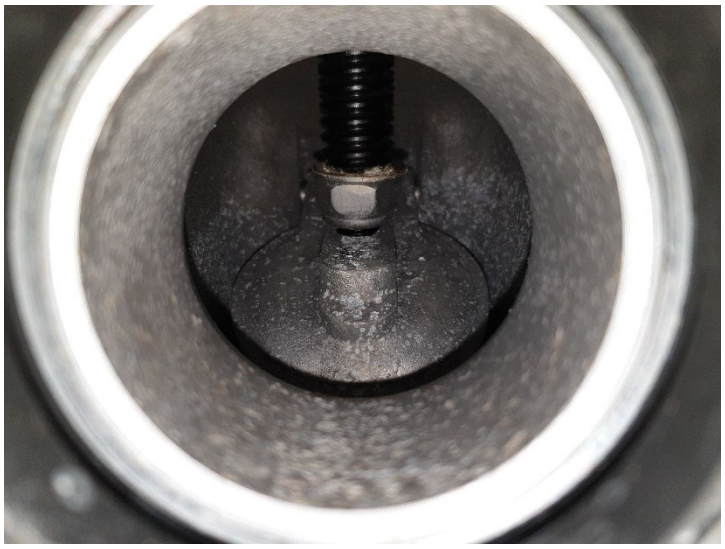
2. Every three months -
Fully open the valve and, using a torch, examine the non return flap rubber sealing washer (14)
If damaged or worn, replace the rubber sealing washer. To do this it is first necessary to remove the outlet adaptor, (2) see page 3, section 1, for instructions. Then remove one of the circlips (5) and withdraw the pivot pin (3). The flap (13) can then be extracted from the valve. Replace the rubber sealing washer (14) and plastic inserts (16). Apply Loctite 222 to the screw threads before hand tightening.
Reassemble by reversing the above instructions.
Fully close the valve, and using a small brush, apply Lithium EP21 plus Moly Grease to the exposed spindle threads.
If the spindle stop is the old roll pin type replace with the latest Nyloc nut type.
If the spindle is of the latest Nyloc nut type check that the nut is still tight, and that the spindle protrudes through the nut. DO NOT ATTEMPT TO UNSCREW IT (ANTI-CLOCKWISE) UNLESS THE NUT IS TO BE CHANGED. If the spindle end has worn flush with the nut it should be replaced immediately.
Check there is no leakage from the flap pivot pin O rings (4) and change if necessary.
Grease pivot pin (3) and check that the non return flap is free to articulate.
Check that circlips (5) are firmly in place.

3. Every two years -
Remove the spindle (see instructions page 3), regrease it, fit a new Nyloc nut (12) and O ring (9) and refit.
Inspect the twist release mechanism components and instantaneous seal for damage or corrosion and replace as necessary.

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Screw down valve



Screw down valve, view through the connector showing the spindle with the Nyloc nut and washer fitted to the end of the spindle.

Instructions for Removing / Changing Spindles

The spindle retaining nut may be removed and replaced by accessing through the instantaneous coupling. Access is much easier if the coupling is removed, but this will take longer.

1. With the valve still bolted to the pump, remove the outlet adaptor. To do this dismantle the twist release mechanism, taking care to retain all components. Using a soft mallet strike the cam boss so that the adaptor turns anti-clockwise. Note: Alternatively special spanners are available to enable the adaptor to be removed without dismantling the twist release mechanism, see photograph below.

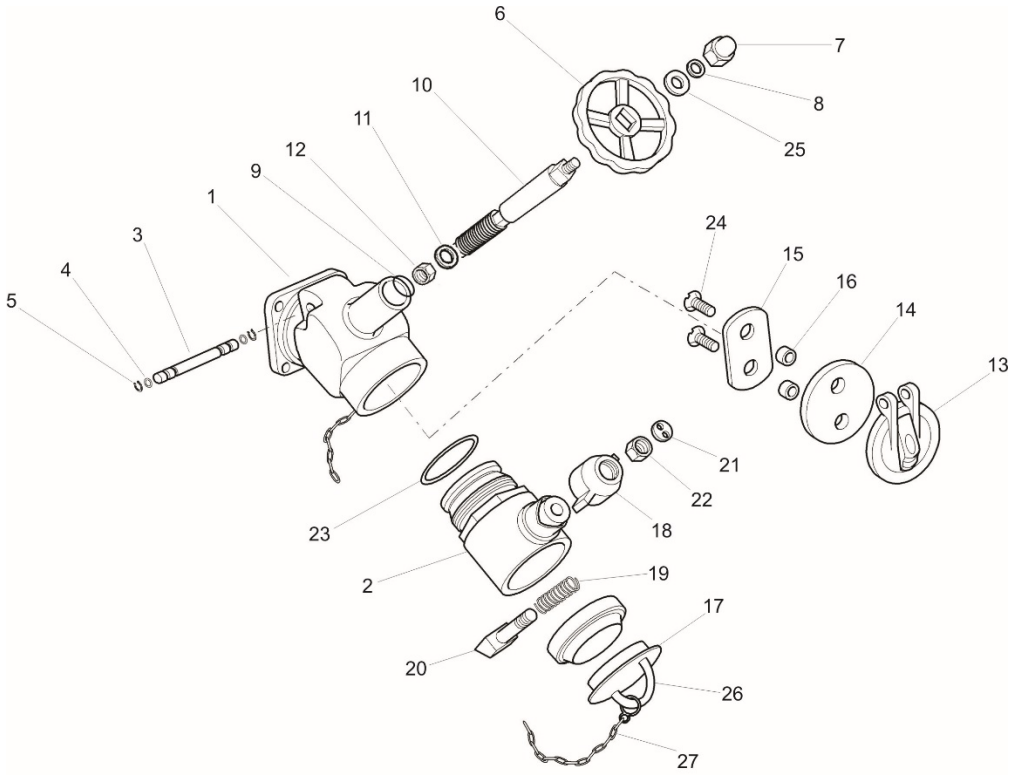
If a storz connector is fitted this may also need a special spanner to remove from the valve body.

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2. Remove the handwheel from the spindle using a 13mm spanner. Retain the nut, plain washer and spring washer.
3. To remove the spindle half open the valve and grip the Nyloc nut using a 19mm open spanner. Using a special 14.5mm square “spanner” or 17mm socket spanner to grip the square on top of the spindle, turn the spindle anti-clockwise to disengage from the Nyloc nut.
4. To remove an old style spindle half open the valve so that the pin is accessible through the valve outlet. Using a 1/8” pin punch, gently hammer the punch to knock the pin, taking care not to jam the punch in the hole.
5. Unscrew the spindle from the valve. Any excessive stiffness indicates damage to the thread in the valve body which should be returned for inspection and repair. Remove any residual Loctite from the 12mm thread using a fine wire brush (applies to spindle with Nyloc nut).
6. Generously apply Lithium EP21 plus Moly Grease to the large diameter only of the reused or replacement spindle. Screw the spindle into the valve body until four large diameter threads are showing inside the body.
7. Apply Loctite 2701 to the thread of a new Nyloc nut. Place a new washer (11) over the small thread at the lower end of the spindle and screw on the Nyloc nut (12). Grip the nut using a 19mm open spanner and turn the spindle clockwise using the handwheel square until fully tight when approximately 4mm of spindle will protrude through the nut.
It should be noted that Nyloc nuts lose effectiveness if refitted after removal. Used nuts should always be discarded and a new nut fitted.
8. Use a 13mm spanner to replace the handwheel ensuring that both the plain washer and spring washer are fitted under the 8mm dome nut.
9. Replace the O ring (23) and refit the outlet adaptor and twist release mechanism.

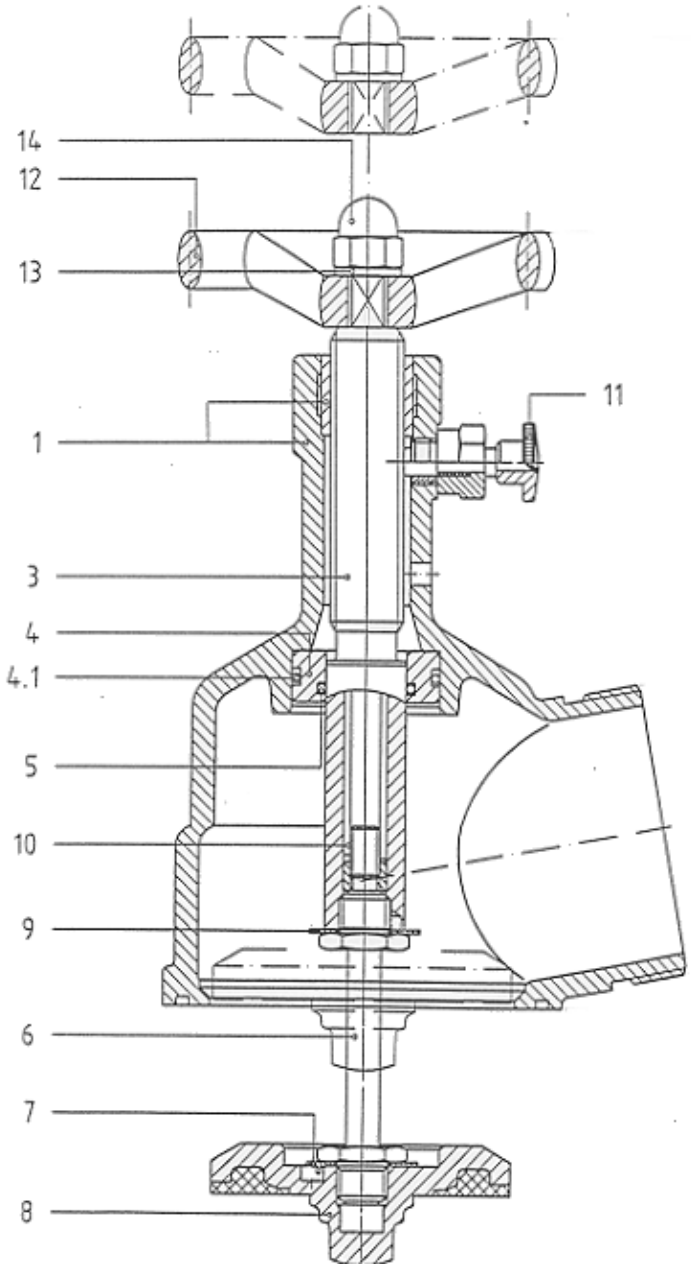
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Item	Description	Quantity	Aluminium	Gunmetal	Notes
	Complete assembly	-	56544/01	56545/01	
1	Main Body	1	N/A	N/A	Valve body and connector
2	2.5" I/C Body	1	N/A	N/A	are not available separately
3	Pivot Pin	1	56979/03	56979/03	If required, order complete valve – see top of list
4	'O' Ring	2	56979/02	56979/02	
5	Circlip	2	56979/01	56979/01	
6	Screw Down Handle	1	56979/22	56979/22	Crank handle - order 56132/03
7	Domed Nut	1	56979/09	56979/09	
8	Spring Washer	1	56979/08	56979/08	
9	'O' Ring	1	56979/10	56979/10	
10	Screw Down Spindle	1	56979/16	56979/16	
11	Washer	1	56979/30	56979/30	
12	Nyloc nut	1	MS141/7	MS141/7	
13	Non Return Flap	1	56979/18	56979/19	
14	Non Return Flap Washer	1	56979/07	56979/07	
15	Retaining Washer	1	56979/06	56979/20	
16	Washer Insert	2	56979/05	56979/05	
17	Instantaneous Seal	1	FWP1003/A	FWP1003/A	
18	Twist Release Knob	1	56979/26	56979/27	
19	Release Spring	1	56979/14	56979/14	
20	Release Plunger	1	56979/13	56979/21	
21	Knob Closure bung	1	56979/31	56979/25	
22	Nyloc Nut	1	56979/32	MS141/5	
23	'O' Ring	1	56979/15	56979/15	
24	Countersunk Screw	2	56979/04	56979/04	
25	Plain Washer	1	MS125/9	MS125/9	
26	Blank cap	1	2415	2415	
27	Chain	1	TH4749	TH4749	

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Continental Delivery Valves



1	Body, incl. Nipple
3	Spindle
4	Guide Sleeve
4.1	O-Ring
5	X-Ring
6	Guide Axle Complete
7	Tap Washer
8	Valve Plate Complete
9	Tap Washer
10	Compression Spring
11	Release Knob Assembly
12	Handwheel
13	Washer

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14	Cap Nut

Function

The valve opens and closes by turning the handwheel anti-clockwise and clockwise respectively and has an integrated, automatic non-return device. The handwheel should be opened until the spindle travels against the stop and then twisted half a turn in the opposite direction.

When the pump is temporarily stopped, the non-return valve keeps the delivery hose filled and prevents the water in the hoses from draining via the pump inlet.

To drain filled delivery hoses, especially when hoses are connected to a dry riser at buildings, pull Release Knob (11). The handwheel may now be turned further in the opening direction and water is allowed to drain via the pump.

Maintenance

The spindle should be greased (lubricated) on a quarterly basis, using a proprietary waterproof grease such as Shell Retinex A or equivalent.

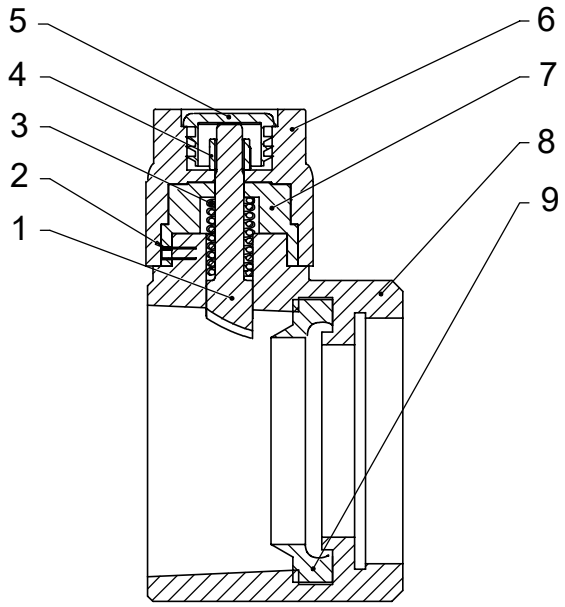
Caution

When opening the valve do not force the handwheel against its stop. NB. Max. working pressure is 16bar.

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Instantaneous Connector Servicing Procedure:

Item	Description
1	Twist release bolt
2	Self-lock pin
3	Spring, twist release
4	Nyloc nut
5	Closure disc / red plug
6	Twist release knob
7	Twist release cam
8	2½" FM Twist release body
9	2½" Instantaneous seal



Inspection

A. Flush out equipment with clean water after use
B. Inspect equipment monthly and follow maintenance procedures at least once every year
C. Inspect release mechanism for free movement
D. Inspect the rubber seal

Maintenance

If signs of wear or breakdown of the mechanism occur, strip down and replace parts as follows:

1. Remove Knob Closure Disc 5. If the disc is of plastic type, insert pointed tool into hole in disc and prise out. If the disc is metal, use an Ajax ladder key locating in the 2 holes in the disc and unscrew anti-clockwise.
2. Unscrew nut 4 using a socket spanner and Knob 6 can then be removed.
3. Withdraw Bolt 1 and Spring 3 from the inside of the female instantaneous body.
4. Check for signs of dirt, wear or corrosion of the Spring, clean the parts and reassemble. If wear has occurred replace the affected parts with spares.
5. Reassemble the mechanism by reversing the foregoing instructions using a lubricating grease on the Spring and the Bolt.
6. When tightening Nut 4 the tension on the spring is correct when the leading edge of the curved face of Bolt 1 is level with the bolt hole edge as shown in diagram above.
7. Check Seal 9 for dirt, cuts or damage to seal lip after cleaning. If damaged, replace with spare seal.

Special Notes

- The recommended lubricant for the bolt and spring is Molybdenum Disulphide Grease (Lithium Grease)
- Always use a new locknut when reassembling the mechanism.

IDEX FIRE SUPPRESSION GROUP

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17. Tightening Torques

Part	Description	Torque	
		Nm	Lbs ft
MS164/20	65019/001 Seal Housing to Clutch Stator	20	15
NPN	65017/004 Friction plate to eccentric drive. (Clutch manufacturers supply)	28	21
MS166/25	65094 Seal housing to bearing housing	20	15
MS165/35	65040 Cover plate to pump head	44	32
65405	65004 Rear wear ring to cover plate	8	6
MS164/25	65078 Front wear ring to suction tube	8	6
65181	Impeller retaining nut	300	225
MS07/35	Drive flange retaining screw	103	76
65169	Screw retaining piston primer to yoke in bearing housing	20	15
60015/001	Tachometer sender, tightening into bearing housing	3	2.2

18. Special Tools

Part	**For Piston Primer Equipped Pumps** Description
60275/03	Clamping spacer
65486	Mechanical seal extraction tool
65239	Piston seal assembly tool – cone locator
65240	Piston seal assembly tool – seal expander
65436	Circlip fitting tool – piston primer seal replacement
65466	Cylinder support tool – piston primer seal replacement
65467	Circlip drift - piston primer seal replacement

Part	**For Water Ring Primer Pumps** Description
60275/03	Clamping spacer
65486	Mechanical seal extraction tool

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19. Adhesives, Solvents and Greases List

The following is a summary of the adhesives, solvents and greases required and the area of application.

Page reference	Location	Adhesive
12	Front wear ring, securing to suction tube	Loctite 243. Tighten to 8Nm.
14	Inside bore of low pressure impeller	Tallow
15	Rear wear ring, securing to pump head or cover plate	Loctite 243. Tighten to 8Nm.
18	HP cover plate, auto drain ball plate, 2 off screws	Loctite 243
18	HP cover plate to pump body, under head of capscrews	Molykote 37. Tighten to 44Nm
19	Mechanical seal assembly, inserting into pump head or impeller	Soft soap solution
25	Piston primer – screw retaining inlet and outlet valves	Loctite 380e
28	Piston primer – o ring (52816) on piston shaft	General purpose grease
31	Piston to yoke, 2 off screws	Loctite 243. Tighten to 20Nm
34	Bearing housing. Fitting bearings to shaft, 2 off.	Tallow
35	Seal housing to clutch stator	Loctite 243. Tighten to 20Nm.
37	Clutch rotor to shaft, inner surface. Early type of assembly only.	Loctite 638
39	Clutch friction plate to eccentric drive, 3 off screws	Loctite 243. Tighten to 28Nm
42	Seal housing to bearing housing, 6 off cap screws	Loctite 243. Tighten to 20Nm
44, 45	Gearbox – drain plugs, oil level check plugs	Loctite 572
52	TRV – o rings on actuator	Water resistant grease
53	Delivery valve, ball type. Valve ball and stem.	Molybdenum disulphide powder
57	Delivery valve, continental type. Spindle	Shell Retinax A or equivalent
58	Instantaneous connector bolt and spring	Molybdenum Disulphide grease (Lithium grease)

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IDEX FIRE SUPPRESSION GROUP

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Gardner Denver

TAMROTOR Compressors

Tempest 3

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Declaration by the manufacturer

(Directive 98/37/EY Annex II B)

Manufacturer's Name:	Gardner Denver Oy
Manufacturer's Address:	Etu-Hankkionkatu 9 FIN-33700 Tampere Finland
hereby declares that	Air End types: Enduro 3, Enduro 6, Enduro 12, Enduro 25, Enduro 75, Enduro 175 and 321 with accessories
is intented to be incorporated into machinery or to be assembled with other machinery to constitute machinery covered by directive as amended;	98/37/EY
and furthermore declares that the machinery into which it is to be incorporated or of which it is to be a component must be declared to be in conformity with the provisons of Directive	98/37/EY
and with national implementing legislation, i.e. as a whole, including the machinery referred to in the declaration	

Tampere
(Place)

9.1.2009
(Date)



(Signature)

Jyrki Mäkiö, Director of Engineering
(Signer, position in company)

Gardner Denver Oy
P.O.Box 516
FIN-33101 Tampere
Finland

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To the user

GARDNER DENVER wishes you welcome among the users of Gardner Denver screw compressors!

This manual instructs you in the correct operation, use, and service of your compressor air end assy.

Read these instructions carefully before taking your product into use.

This ensures correct preparations and use from the very beginning.

Storing the books

All the instructions in this manual have been provided to guarantee long life and reliable operation of your compressor air end.

Terms of guarantee

Acquaint yourself with the terms of guarantee for the compressor. The guarantee becomes void if the conditions are not observed. Do not exceed the maximum pressure, rotation speed, and capacity ratings of the compressor.

The guarantee is not valid if other than original spare parts are used.

Inquiries

When making inquiries concerning your product, always quote the complete type specification and the serial number as they are given on the type plate of the compressor.

Use original spare parts only.

Gardner Denver reserves itself the right to change the construction and manuals of the compressors without prior notice.

Before maintenance

Before any maintenance operations, switch off the compressor with the main switch.

Watch out! The compressor is hot right after stopping.

1. Stop the compressor and wait until the oil separator exhaust is complete (approx. 2 min). Make sure no pressure remains in the oil separator.
2. Switch off the compressor with the main switch and make sure the compressor cannot be started unintentionally.

In the case of an compressor that is remotely controlled or connected to multi-compressor control, fix a sign with the text "service in progress" on the starting device.

3. Close the shut-off valve between compressor and compressed-air system.
4. Open the safety valve cap for 4 to 5 turns.

After maintenance

1. Close the safety valve.
2. Open the shut-off valve between compressor and compressed-air system.
3. Start the compressor.

Adding and changing oil

Use recommended oil types only. Do not mix different oils.

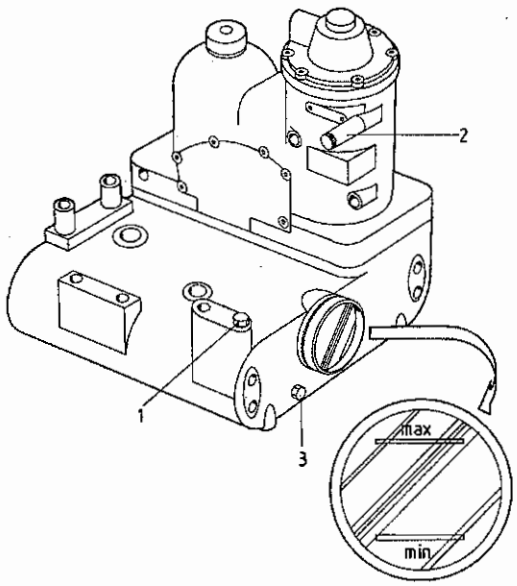
Watch out! The oil is hot right after compressor stop.

Do not remove the filler plug when the oil separator is under pressure.

Dispose of old oil according to the waste oil regulations.

Adding oil

1. Take the precautions listed on page 2.
2. Remove filler plug (1) and pour in new oil until the upper limit of the level indicator is reached.
3. Put filler plug (1) back in its place.
4. Close safety valve (2) and open the shut-off valve between compressor and compressed-air system.



Oil change

1. Run the compressor until the oil temperature is + 40 ... 50°C.
2. Take the precautions listed on page 2.
3. Remove filler plug (1). Open drain valve (3) and let the oil flow out.
4. Close drain valve (3) and top up the oil sump with fresh oil.
5. Put filler plug (1) back in its place.
6. Close safety valve (2) and open the shut-off valve between compressor and compressed-air system.

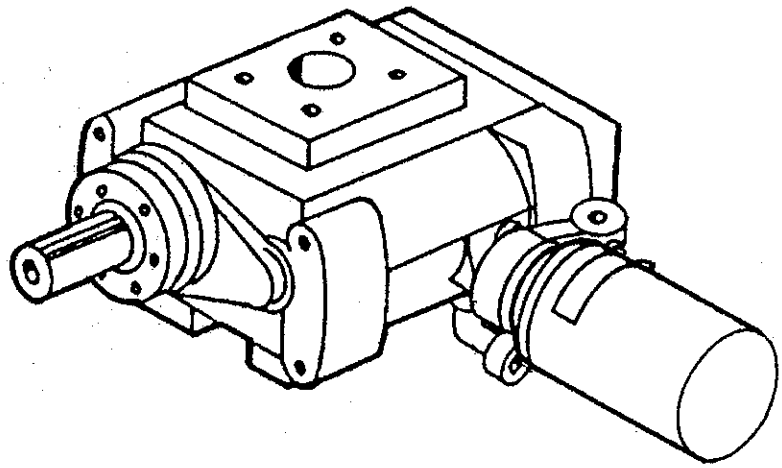
Replacing the oil filter

Allow the compressor to cool down before the replacement.

Dispose of the old filter according to the regulations on hazardous waste.

Use original Gardner Denver oil filters only.

1. Take the precautions listed on page 2.
2. Use a protective cloth as some oil will escape when the filter is being removed.
3. To remove the oil filter, turn it counter-clockwise with the help of a straining strap.



Mounting

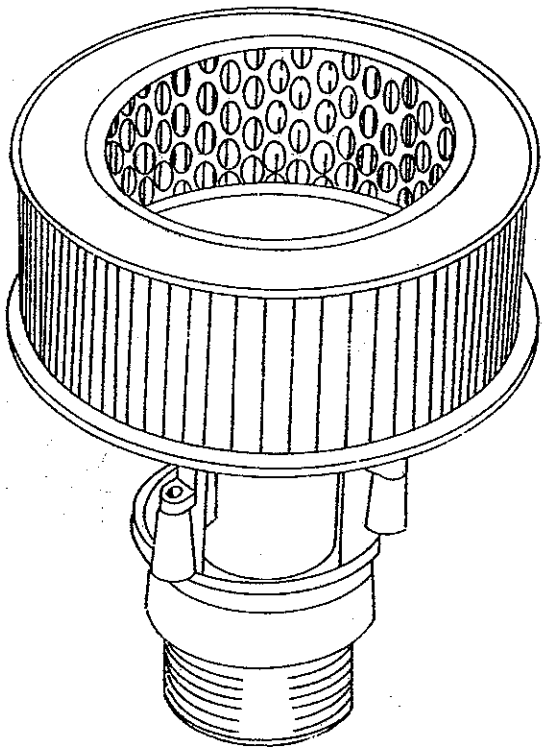
1. Lubricate the seal of the new filter with oil.
2. Mount the filter by turning it manually clockwise.

Replacing the air filter

Allow the compressor to cool down before the replacement.

The filter cannot be cleaned and reused.

Make sure no impurities etc. get in through the open valve as they could cause damage to the air end.



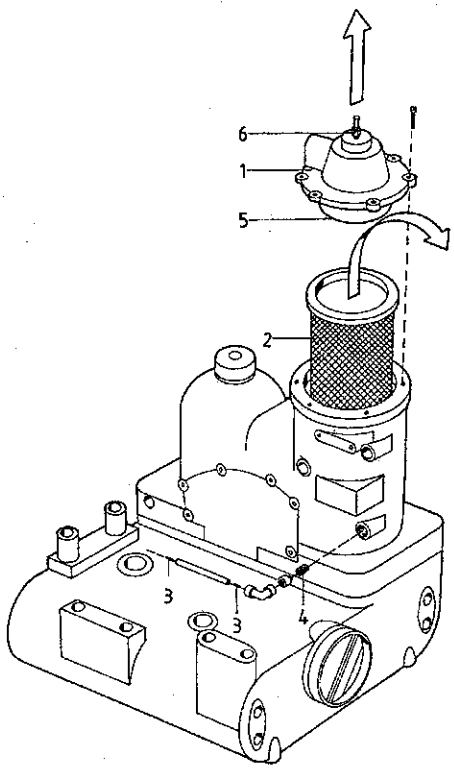
1. Take the precautions listed on page 2.
2. Remove the filter cover and the old filter.
3. Mount a new filter and put the cover back in its place.

Replacing the oil separator element

Dispose of the old element according to the regulations on hazardous waste.

Allow the compressor to cool down before the replacement.

1. Take the precautions listed on page 2.
2. Remove output control valve (1).
3. Remove oil separator element (2).

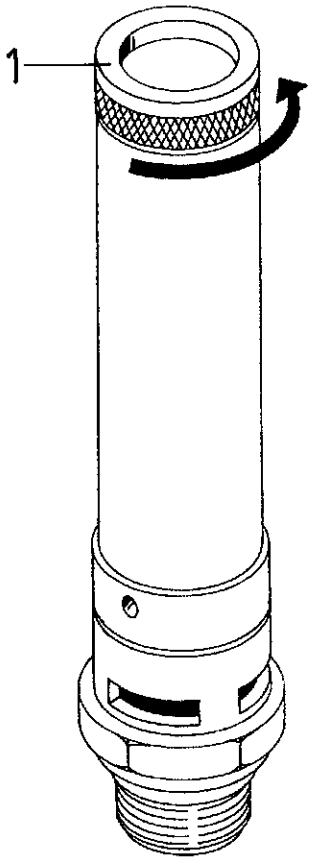


Mounting

1. Clean output control valve (1) and the contact surfaces of the oil separator.
2. Clean orifices (3) in the hose ends.
3. Clean strainer (4) and, if necessary, the oil separator.
4. Lubricate the O ring of the oil separator and mount a new element (2).
5. Replace the O ring (5) between oil separator and output control valve.
6. Replace the seals of the output control valve with a new set. When assembling the valve, leave nut M6 (6) about 2 mm off the valve cover.
7. Mount the assembled valve back in its place.
8. Tighten the screws alternately to equal tightness.

Testing safety valve

All adjusting and repair work on the safety valve must be left for a qualified mechanic. (Observe the local regulations.)



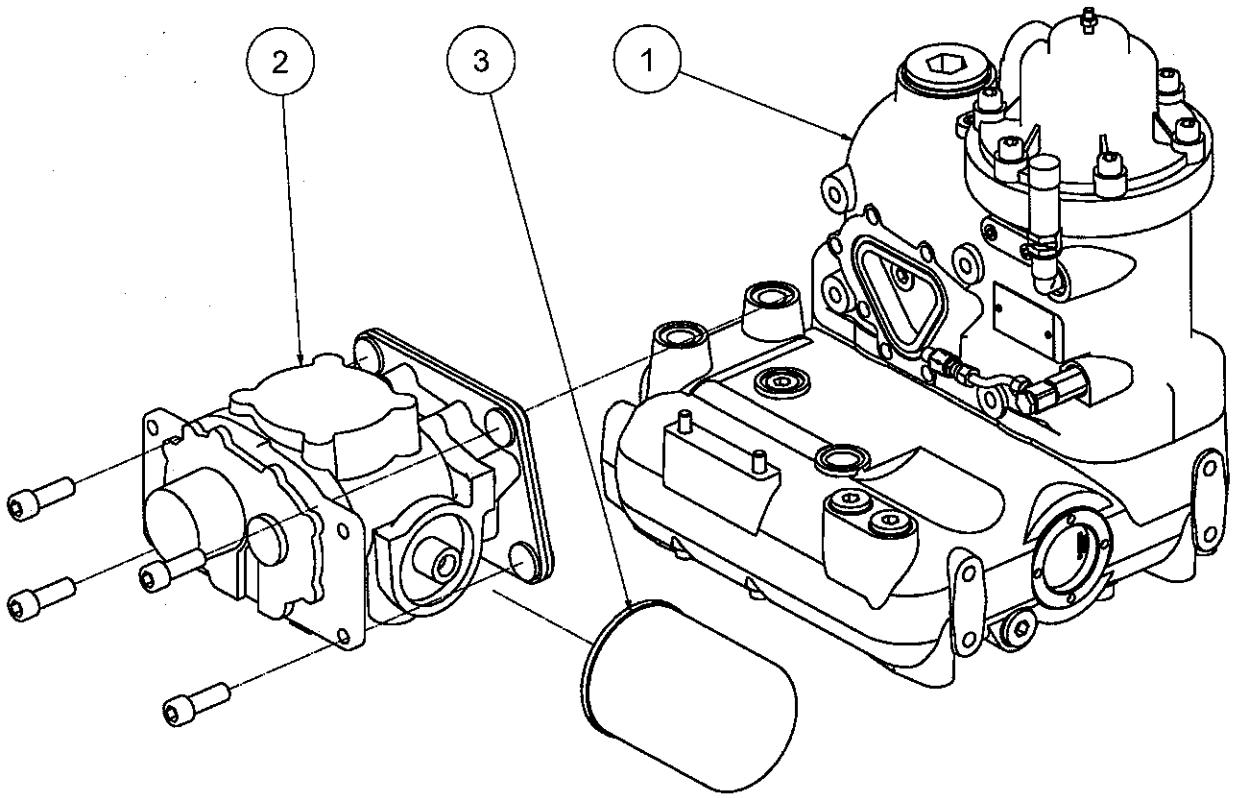
The opening pressure of the safety valve must be tested in a separate pressurized air line.

The operation of the valve can be tested by turning the cap (1) of the valve 1 – 2 turns counterclockwise.

Varaosat
Reservdelar
Spare parts

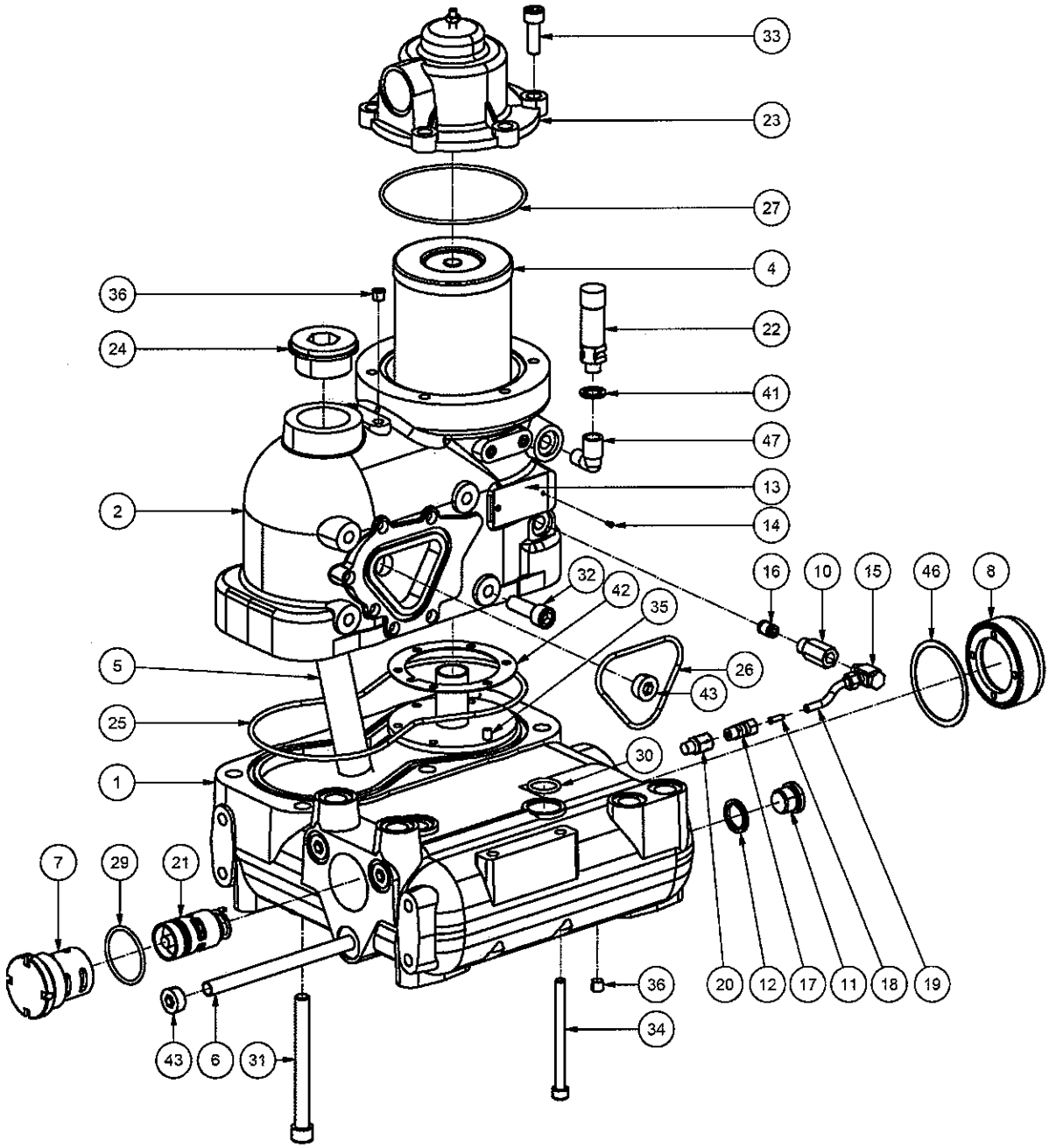
Tempest 3
376 596 63

TEMPEST EQUIPMENT

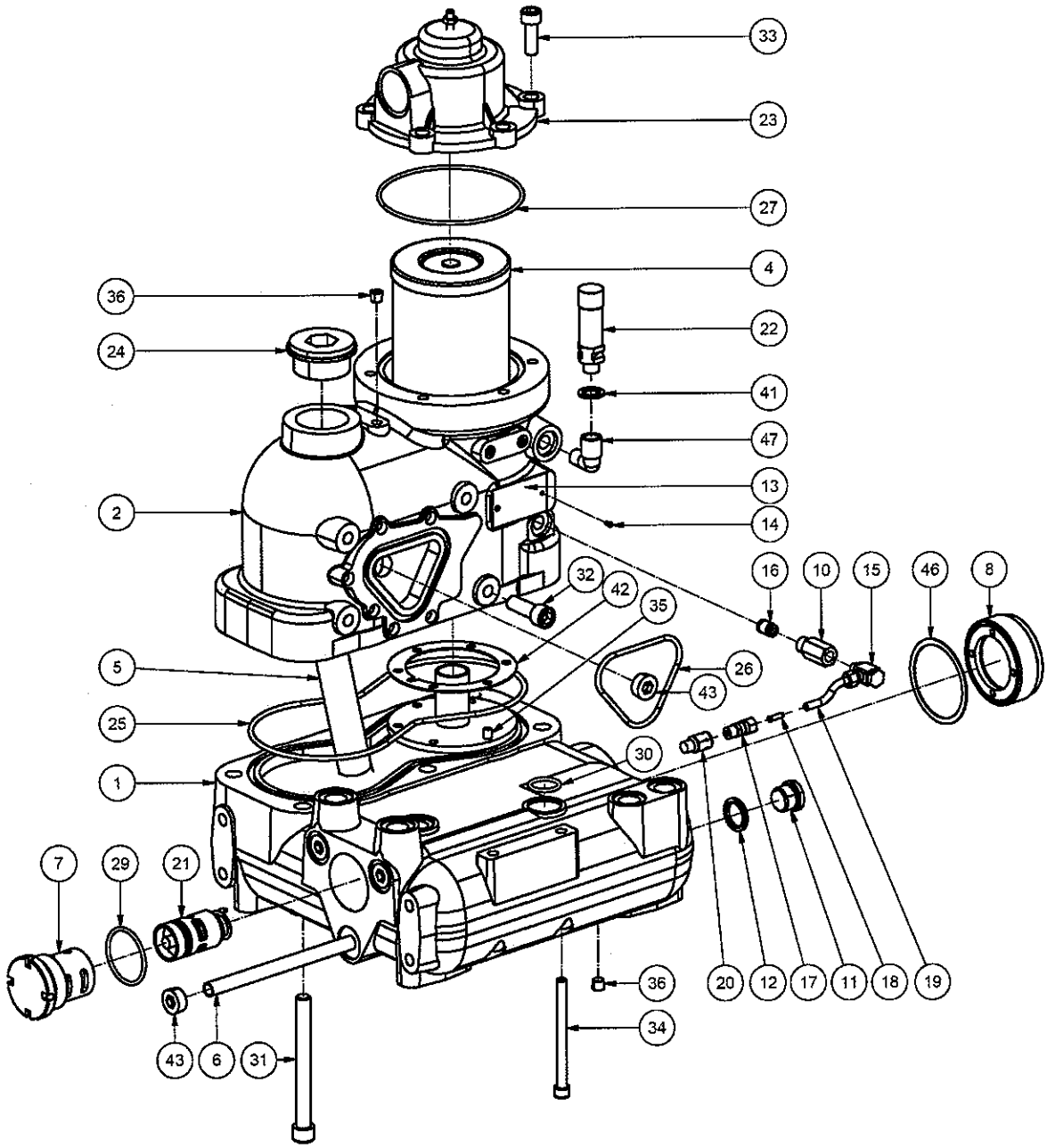


Viite N:o Det.Nr. Ref. No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys TEMPEST KP	 TEMPEST SMST	 TEMPEST EQUIPMENT
1		1	Katso tempest	Se tempest	See tempest
2		1	Katso kompressoriyksikkö	Se kompressorenhet	See compressor air end
3	81649209	1	Öljynsuodatin	Olje filter	Oil filter

TEMPEST 3

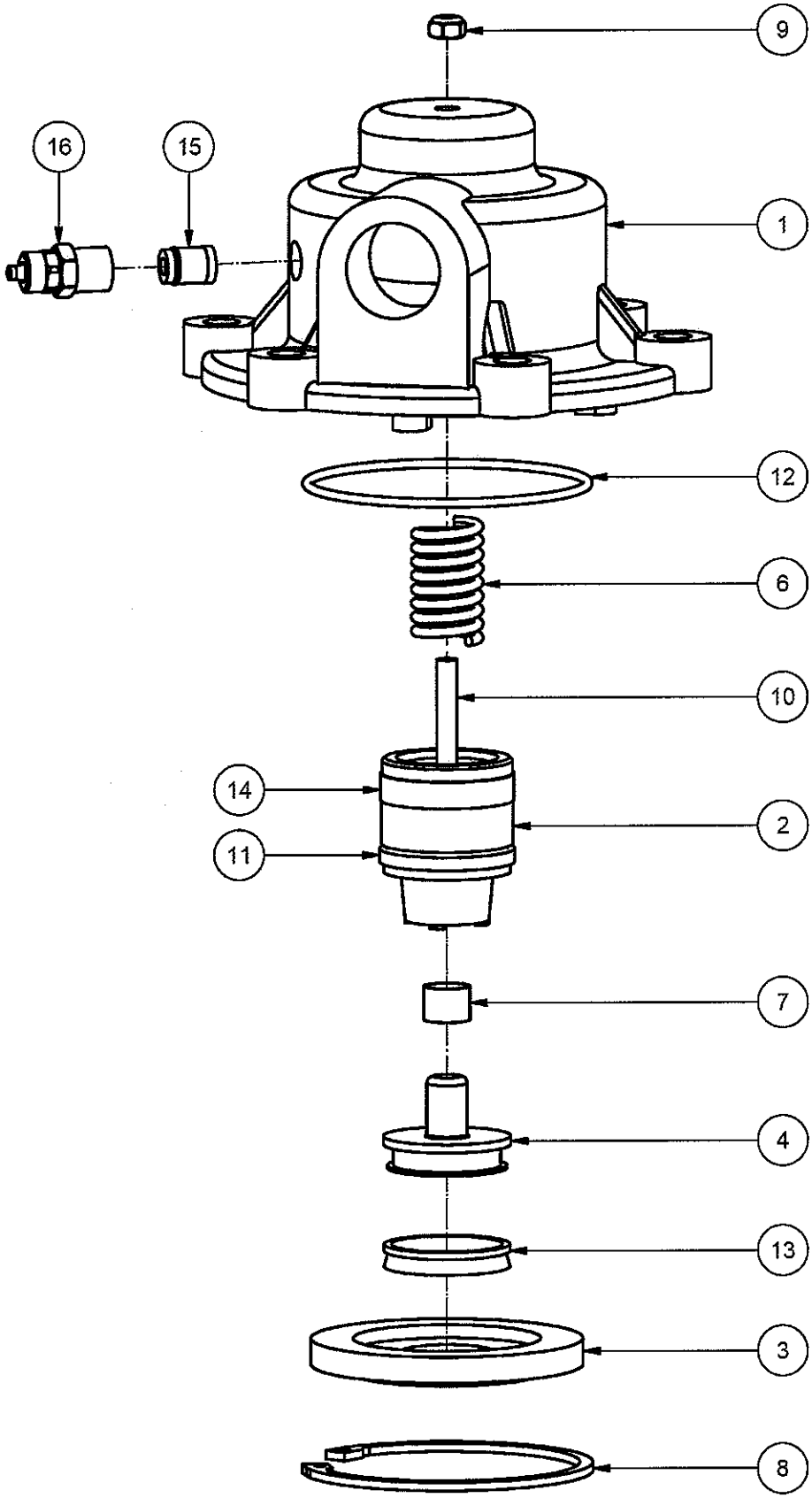

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Viite N:o Det.Nr. Ref. No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys Benämning Description
			TEMPEST 3 **TEMPEST 3** **TEMPEST 3**
	CC1019186		Korjaussarja kp Osat 8, 46 Reparationssats smst Delar 8, 46 Repair kit assy Items 8, 46
1	040 281 78	1	Runko Ram Frame
2	040 282 08	1	Sykloni Cyklon Cyclone
4	035 822 28	1	Öljynerotin Oljeavskiljare Oil separator
5	376 220 58	1	Syklonіputki Cyklonrör Cyclone tube
6	376 221 88	1	Imuputki Sugrör Suction tubes
7	376 222 08	1	Sylinteri Cylinder Cylinder
8		1	Näkölasi kp Olje kontroll glas Oil checking glass
10	309 414 48	1	Suodinnippa Filternippel Filter nipple
11	033 811 78	3	Tulppa Plugg Plug
12	800 347 99	3	Tiiviste Tätning Gasket
13	309 403 08	1	Kilpi Platta Plate
14	455 332 90	2	Ahtoruuvi Nit Rivet
15	852 672 19	1	Banjoliitin Banjoanslutning Banjo fitting
16	855 886 19	1	Suodatin Filter Filter
17	817 443 09	1	Suoralähtö I-nippel I-nipple
18	308 975 58	2	Kuristushylsy Strypningshylsa Orifice socket
19	852 002 99	1	Muoviputki Plaströr Plastic pipe
20	895 977 79	1	Vastaventtiili Backventil Non-return valve
21	895 601 69	1	Termostaatti elementti Termostatelement Thermostat element
22	VP1027032	1	Varoventtiili Säkerhetsventil Safety valve
23	036 030 78	1	Tuottoventtiili Utloppsventil Discharge valve
24	853 280 79	1	Kuusiokolotulppa Insexkantplugg Hex socket plug
25	872 846 09	1	O-rengas O-ring O-ring
26	895 867 39	1	O-rengas O-ring O-ring
27	853 879 79	1	O-rengas O-ring O-ring
29	856 462 99	1	O-rengas O-ring O-ring
30	895 944 69	1	O-rengas O-ring O-ring
31	895 586 49	6	Kuusiokoloruuvi Insexkantskruv Hex.socket screw
32	445 824 40	4	Kuusiokoloruuvi Insexkantskruv Hex.socket screw
33	445 726 70	6	Kuusiokoloruuvi Insexkantskruv Hex.socket screw
34	895 868 69	2	Kuusiokoloruuvi Insexkantskruv Hex.socket screw
35	802 421 59	6	Kuusiokoloruuvi Insexkantskruv Hex.socket screw
36	807 047 79	5	Kuusiokolotulppa Insexkantplugg Hex socket plug
38	818 407 89	6	Kuusiokoloruuvi Insexkantskruv Hex.socket screw
39	442 502 60	2	Kuusioruuvi Sexskruv Hex.screw
41	801 802 69	1	Tiiviste Tätning Gasket
42	308 096 58	1	Tiiviste Tätning Gasket


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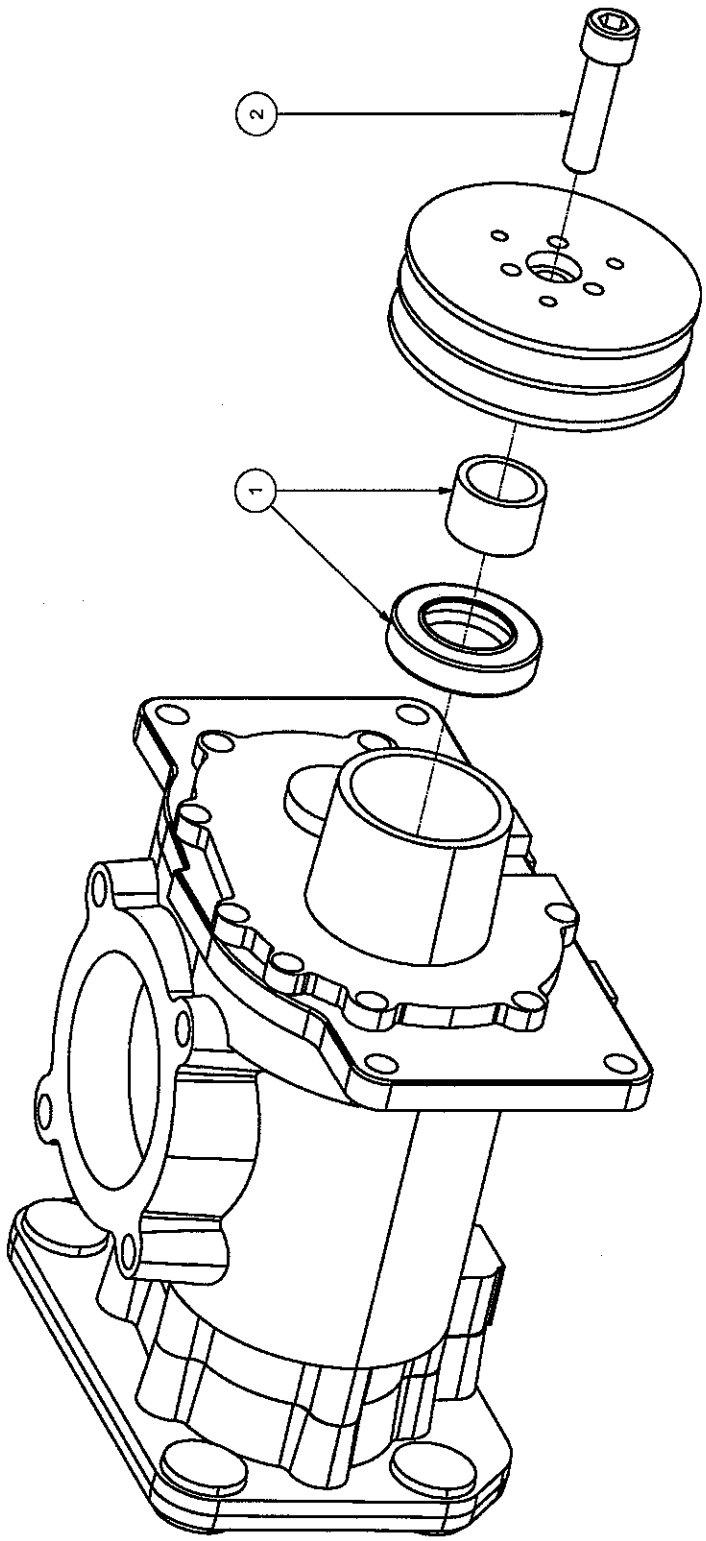
Viite N:o Det.Nr. Ref. No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys Benämning	 Description
43	895 844 39	5	Kuusiokolotulppa	Insexkantplugg	Hex socket plug
46		1	Tiiviste	Tätning	Gasket
47	620 504 60	1	Kulmayhde	I-nippel	L-nipple

DISCHARGE VALVE

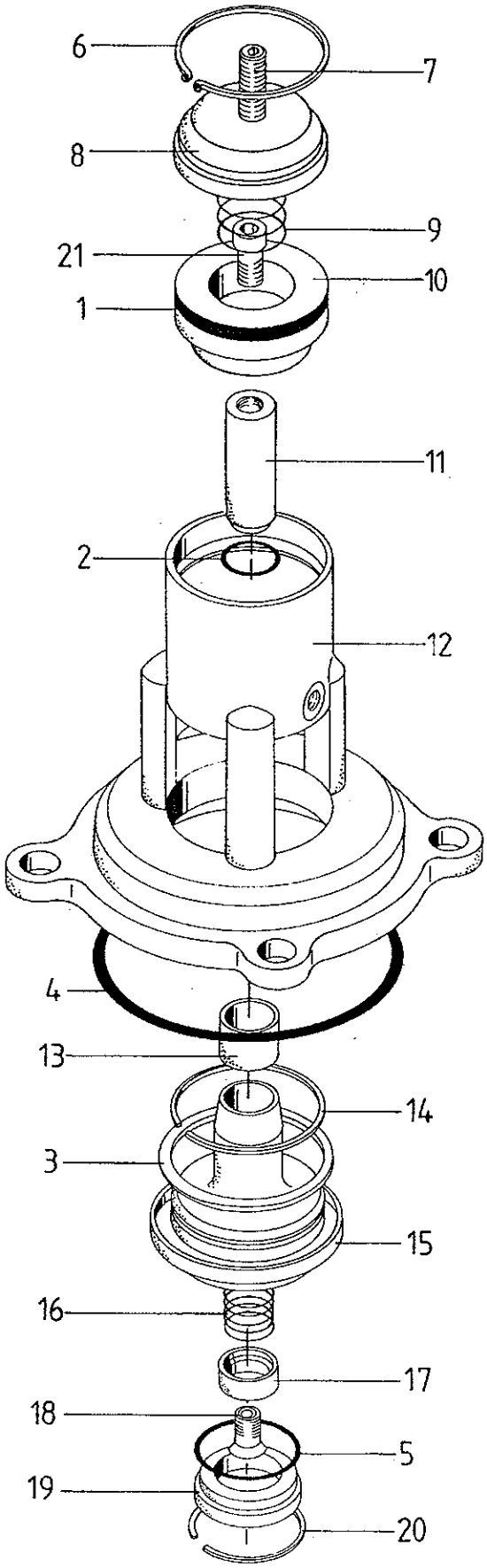


Viite N:o Det.Nr. Ref. No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys Benämning Description		
			TUOTTOVENTTIILI	**UTLOPPSVENTIL**	**DISCHARGE VALVE**
	03389270		Tiivistesarja kok.p. sis.osat 11-14	Tätningssats smst. Delar 11-14	Seal kit assy Items 11-14
	89555599		Korjaussarja kok.p. (sis.osat 1-4,10,15)	Reparationssats smst. (Delar 1-4,10,15)	Repair kit assy (Items 1-4,10,15)
1		1	Runko	Ram	Frame
2		1	Mäntä	Kolv	Piston
3		1	Vastin	Tryckring	Thrustring
4		1	Lautanen	Tallrik	Plate
5		1	Jousi	Fjäder	Spring
6		1	Liukulaakeri	Lager	Bearing
7		1	Lukkorengas	Låsring	Lock ring
8		1	Männän mutteri	Kolvmutter	Piston nut
9		1	Pidätinruuvi	Stoppskruv	Set screw
10		1	Pidätinruuvi	Stoppskruv	Set screw
11		1	Männän tiiviste	Kolvtätning	Piston gasket
12		1	O-rengas	O-ring	O-ring
13		1	Lautasen tiiviste	Tallrikstätning	Plate gasket
14		1	Liukurengas	Släpring	Slide ring
15	85588619	1	Suodin	Filter	Filter
16	03398578	1	Liitin	Förbindning	Connector

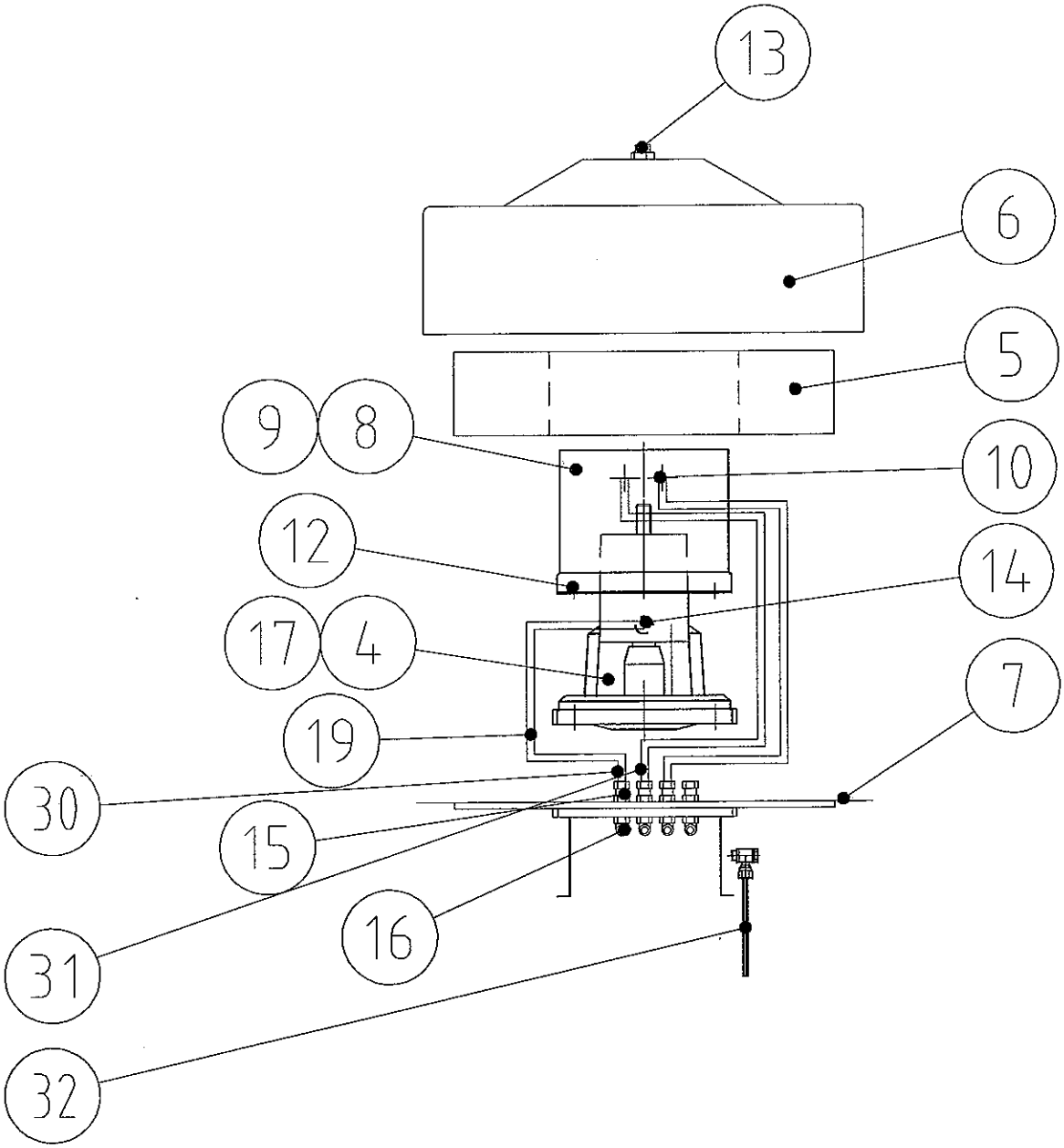
AIR END



Viite N:o Det.Nr. Ref. No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys Benämning Description
			KOMPRESSORI-YKSIKKÖ / **KOMPRESSOR-ENHET** / **COMPRESSOR AIR END**
1	89542409	1	Akselitiiviste kp. / Axeltätning smst. / Shaft seal assy
2	03379238	1	Ruuvi / Skruv / Screw


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Viite N:o Det.Nr Ref.No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys Benämning Description		
	033 887 08		**IMUVENTTIILI**	**SUGVENTIL**	**AIR INLET VALVE**
	033 890 10		Tiivistesarja kok.p. (sis.osat 1-5)	Tätningssats smst. (Delar 1-5)	Seal kit assy (Items 1-5)
	895 551 89		Korjaussarja kok.p. (sis.osat 1-5,9,13,16)	Reparationssats smst. (Delar 1-5,9,13,16)	Repair kit assy (Items 1-5,9,13,16)
1		1	Tiiviste	Tätning	Gasket
2		1	O-rengas	O-ring	O-ring
3		1	Tiiviste	Tätning	Gasket
4		1	O-rengas	O-ring	O-ring
5		1	O-rengas	O-ring	O-ring
6		1	Lukkorengas	Låsring	Lock ring
7		1	Ruuvi	Skruv	Screw
8		1	Kansi	Lock	Cover
9	033 973 08	1	Jousi	Fjäder	Spring
10		1	Mäntä	Kolv	Piston
11		1	Männänvarsi	Kolvstång	Piston rod
12		1	Runko	Ram	Frame
13		1	Laakeriholkki	Lager bussning	Bearing bushing
14		1	Pidätinrengas	Stoppring	Retaining ring
15		1	Lautanen	Tallrik	Plate
16		1	Jousi	Fjäder	Spring
17		1	Laakeriholkki	Lager bussning	Bearing bushing
18		1	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
19		1	Tulppa	Plugg	Plug
20		1	Lukkorengas	Låsring	Lock ring
21		1	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw


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Viite N:o Det.Nr Ref.No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys	Benämning	Description
			ILMANSUODATIN	**LUFTFILTER**	**AIRFILTER**
4	033 887 08	1	Imuventtiili	Insugningsventil	Air inlet valve
5	856 443 09	1	Ilmansuodatin	Luftfilter	Air filter
6	037 482 98	1	Kansi	Lock	Cover
7	035 899 88	1	Pohjalevy	Grundplatta	Bottom plate
8	036 337 48	1	Öljynkerääjä	Oljekopp	Oil cup
9	034 288 78	1	Tiiviste	Tätning	Gasket
12	446 110 40	4	Kuusiokoloruuvi	Insexkantsruv	Hex.socket screw
13	802 200 59	1	Siipimutteri	Vingmutter	Wing nut
14	817 442 79	1	Kulmaliitin	Vinkelrör	Elbow
15	817 444 29	3	Suoraliitin	Förbindning	Connector
16	817 443 09	3	Suoraliitin	Förbindning	Connector
	810 683 29	1	Kuusioruuvi	Sexkantskruv	Hex.screw
	813 563 09	4	Tiiviste	Tätning	Gasket
17	800 118 39	1	O-rengas	O-ring	O-ring
19	852 002 99	1	Muoviputki	Plastslang	Plastic pipe
30	308 975 58	1	Kuristushylsy	Strypning	Orifice
31	308 954 08	1	Kuristushylsy	Strypning	Orifice
31	852 672 19	1	Banjoliitin	Förbindning	Connector
	852 002 99	1	Muoviputki	Plastslang	Plastic pipe

IDEX FIRE SUPPRESSION GROUP

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Gardner Denver

TAMROTOR Compressors

Tempest 6

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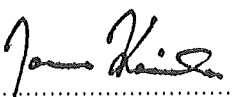
Declaration by the manufacturer

(Directive 98/37/EY, Anenx II B)

Manufacturer's Name:	Gardner Denver Oy
Manufacturer's Address:	Etu-Hankkionkatu 9 FIN-33700 Tampere Finland
herewith declares that	Tempest 6 + Enduro 6
is intented to be incorporated into machinery or to be assembled with other machinery to constitute machinery covered by directive as amended; does therefore not in every respect comply with the provisions of this directive; does comply with the provisions of the follo-wing other EEC directives.	98/37/EY
And furthermore declares that is not allowed to put the machinery into service until the machinery into which it is to be incorporated or of which it is to be a component has been found and declared to be in conformity with the provisions of Directive and with national implementing legislation, i.e. as a whole, including the machinery referred to in this declaration	98/37/EY

Tampere
.....
(place)

13.03.2002
.....
(date)



.....
(signature)

Jorma Koivula, Design Manager
.....
(signer, position in company)

Gardner Denver Oy
P.O. Box 516
33101 Tampere
Finland

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To the user

GARDNER DENVER wishes you welcome among the users of Gardner Denver screw compressors!

This manual instructs you in the correct operation, use, and service of your compressor air end assy.

Read these instructions carefully before taking your product into use.

This ensures correct preparations and use from the very beginning.

Storing the books

All the instructions in this manual have been provided to guarantee long life and reliable operation of your compressor air end.

Terms of guarantee

Acquaint yourself with the terms of guarantee for the compressor. The guarantee becomes void if the conditions are not observed. Do not exceed the maximum pressure, rotation speed, and capacity ratings of the compressor.

The guarantee is not valid if other than original spare parts are used.

Inquiries

When making inquiries concerning your product, always quote the complete type specification and the serial number as they are given on the type plate of the compressor.

Use original spare parts only.

Gardner Denver reserves itself the right to change the construction and manuals of the compressors without prior notice.

Before maintenance



Before any maintenance operations, switch off the compressor with the main switch.

Watch out! The compressor is hot right after stopping.

1. Stop the compressor and wait until the oil separator exhaust is complete (approx. 2 min). Make sure no pressure remains in the oil separator.
2. Switch off the compressor with the main switch and make sure the compressor cannot be started unintentionally.



In the case of an compressor that is remotely controlled or connected to multi-compressor control, fix a sign with the text "service in progress" on the starting device.

3. Close the shut-off valve between compressor and compressed-air system.
4. Open the safety valve cap for 4 to 5 turns.

After maintenance

1. Close the safety valve.
2. Open the shut-off valve between compressor and compressed-air system.
3. Start the compressor.

Adding and changing oil

Use recommended oil types only. Do not mix different oils.

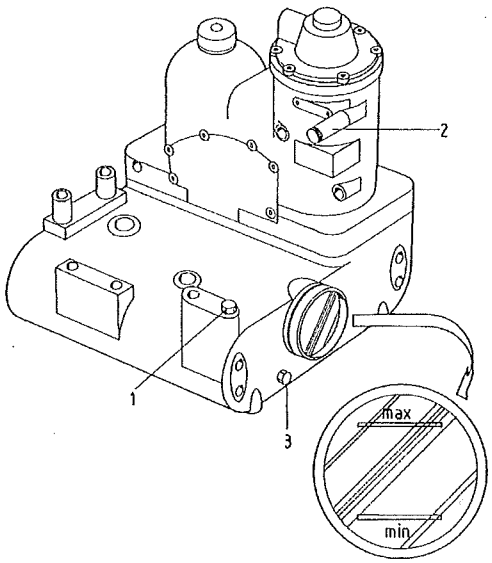
Watch out! The oil is hot right after compressor stop.

Do not remove the filler plug when the oil separator is under pressure.

Dispose of old oil according to the waste oil regulations.

Adding oil

1. Take the precautions listed on page 2.
2. Remove filler plug (1) and pour in new oil until the upper limit of the level indicator is reached.
3. Put filler plug (1) back in its place.
4. Close safety valve (2) and open the shut-off valve between compressor and compressed-air system.



Oil change

1. Run the compressor until the oil temperature is + 40 ... 50°C.
2. Take the precautions listed on page 2.
3. Remove filler plug (1). Open drain valve (3) and let the oil flow out.
4. Close drain valve (3) and top up the oil sump with fresh oil.
5. Put filler plug (1) back in its place.
6. Close safety valve (2) and open the shut-off valve between compressor and compressed-air system.

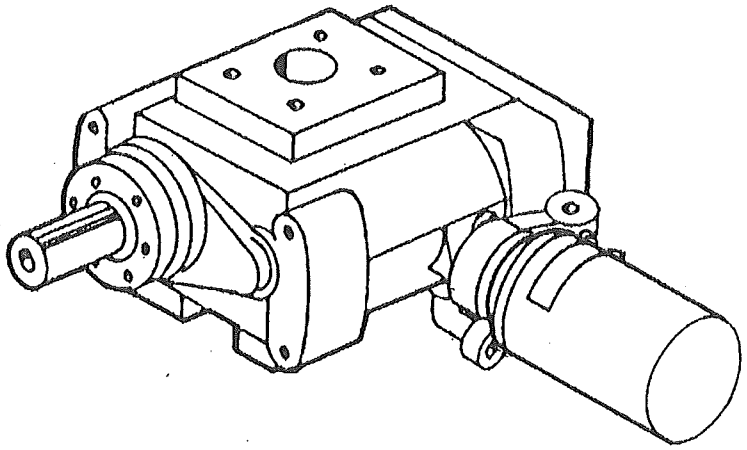
Replacing the oil filter

Allow the compressor to cool down before the replacement.

Dispose of the old filter according to the regulations on hazardous waste.

Use original Gardner Denver oil filters only.

1. Take the precautions listed on page 2.
2. Use a protective cloth as some oil will escape when the filter is being removed.
3. To remove the oil filter, turn it counter-clockwise with the help of a straining strap.



Mounting

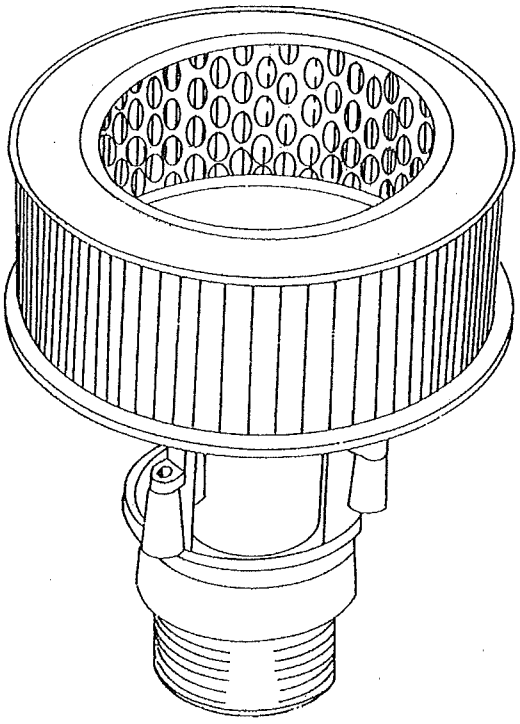
1. Lubricate the seal of the new filter with oil.
2. Mount the filter by turning it manually clockwise.

Replacing the air filter

Allow the compressor to cool down before the replacement.

The filter cannot be cleaned and reused.

Make sure no impurities etc. get in through the open valve as they could cause damage to the air end.



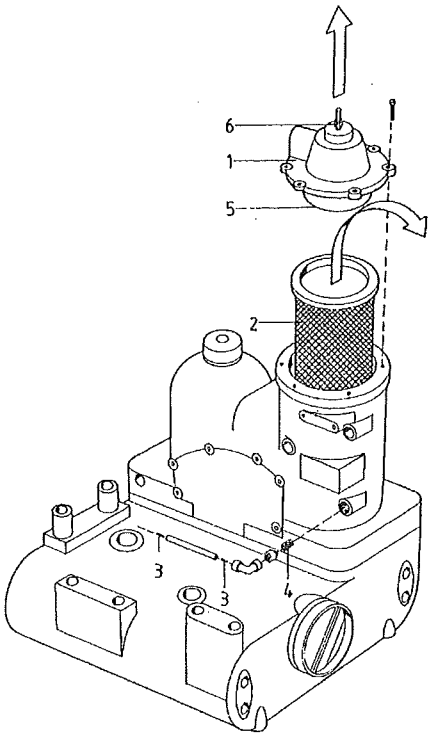
1. Take the precautions listed on page 2.
2. Remove the filter cover and the old filter.
3. Mount a new filter and put the cover back in its place.

Replacing the oil separator element

Dispose of the old element according to the regulations on hazardous waste.

Allow the compressor to cool down before the replacement.

1. Take the precautions listed on page 2.
2. Remove output control valve (1).
3. Remove oil separator element (2).

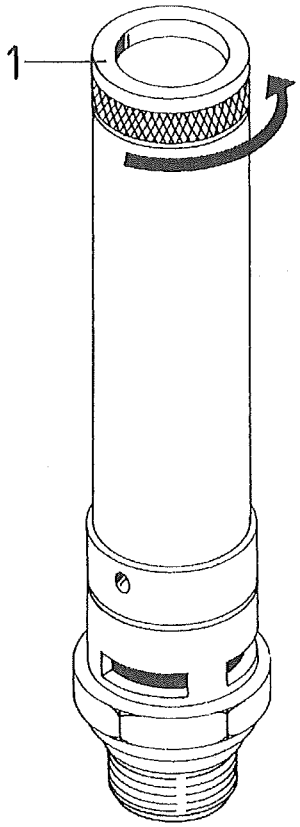


Mounting

1. Clean output control valve (1) and the contact surfaces of the oil separator.
2. Clean orifices (3) in the hose ends.
3. Clean strainer (4) and, if necessary, the oil separator.
4. Lubricate the O ring of the oil separator and mount a new element (2).
5. Replace the O ring (5) between oil separator and output control valve.
6. Replace the seals of the output control valve with a new set. When assembling the valve, leave nut M6 (6) about 2 mm off the valve cover.
7. Mount the assembled valve back in its place.
8. Tighten the screws alternately to equal tightness.

Testing safety valve

All adjusting and repair work on the safety valve must be left for a qualified mechanic. (Observe the local regulations.)



The opening pressure of the safety valve must be tested in a separate pressurized air line.

The operation of the valve can be tested by turning the cap (1) of the valve 1 – 2 turns counterclockwise.

Gardner Denver
20.06.2000

Oil recommendation for Gardner Denver screw compressors in industrial use

We recommend to use motor or circulation oil (hydr. oil) of good quality stated according to below requirements or synthetic hydrocarbon lubricator.

OUR PRIMARY RECOMMENDATION IS GARDNER DENVER AEON 3000 (type F 2105) SCREW COMPRESSOR OIL. THE COMPRESSOR HAS BEEN PREFILLED WITH THIS TYPE OF OIL.

Order number for 10 litres 033 891 41
Order number for 200 litres 033 891 43

If this product is not available there must be noticed the following factors in oil selection:

Mineral oil

Use compressor oil specially made for screw compressors, which contents antioxidants and preventive components against rust, foaming and wearing.

Synthetic lubricant

Use compressor oil specially made for screw compressors, which contents antioxidants and preventive components against rust, foaming and wearing.

Viscosity:

- max. 500 mm^2/s by starting temperature (> 0°C)
- min. 7 mm^2/s by running temperature of oil (= 55°C over the ambient temperature)

Flash point:

- min. 180°C (open cup)

In normal circumstances these conditons are fulfilled when using ISO VG 32...46 or SAE 10W...20W/20 oils.

Before taking the oil in continuous use the following facts should be checked which have effect on compressor operation:

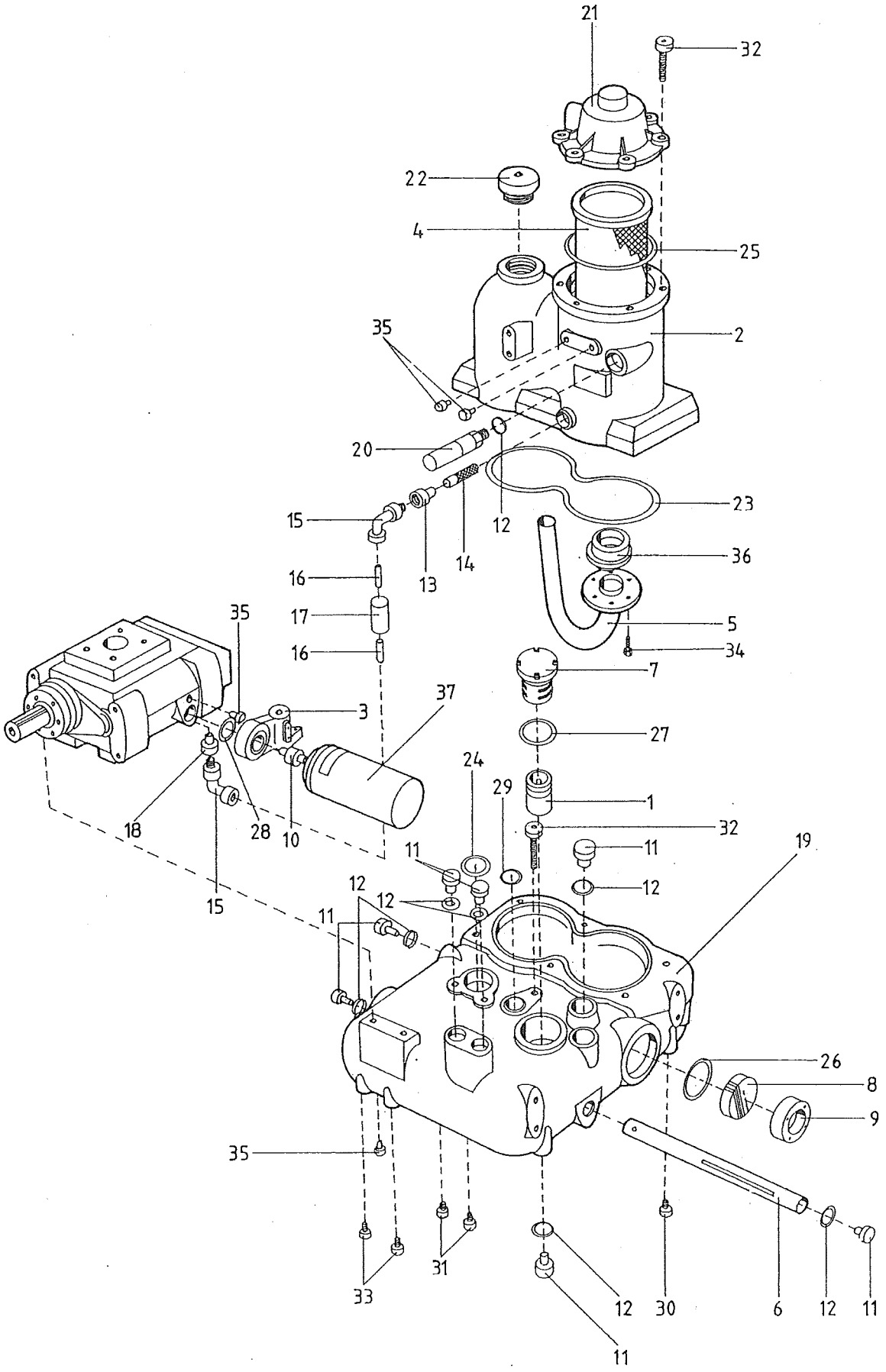
- running temperature (continuous over 90°C running temperature will half the normal oil change intervall for mineral oil)
- oil consumption (high running temperature increases oil consumption)
- if glogged oil separators
- if varnish formation (affects the cooling and oil separation)

Varnish formation can be seen on metal levels as a brown lacquer coating.

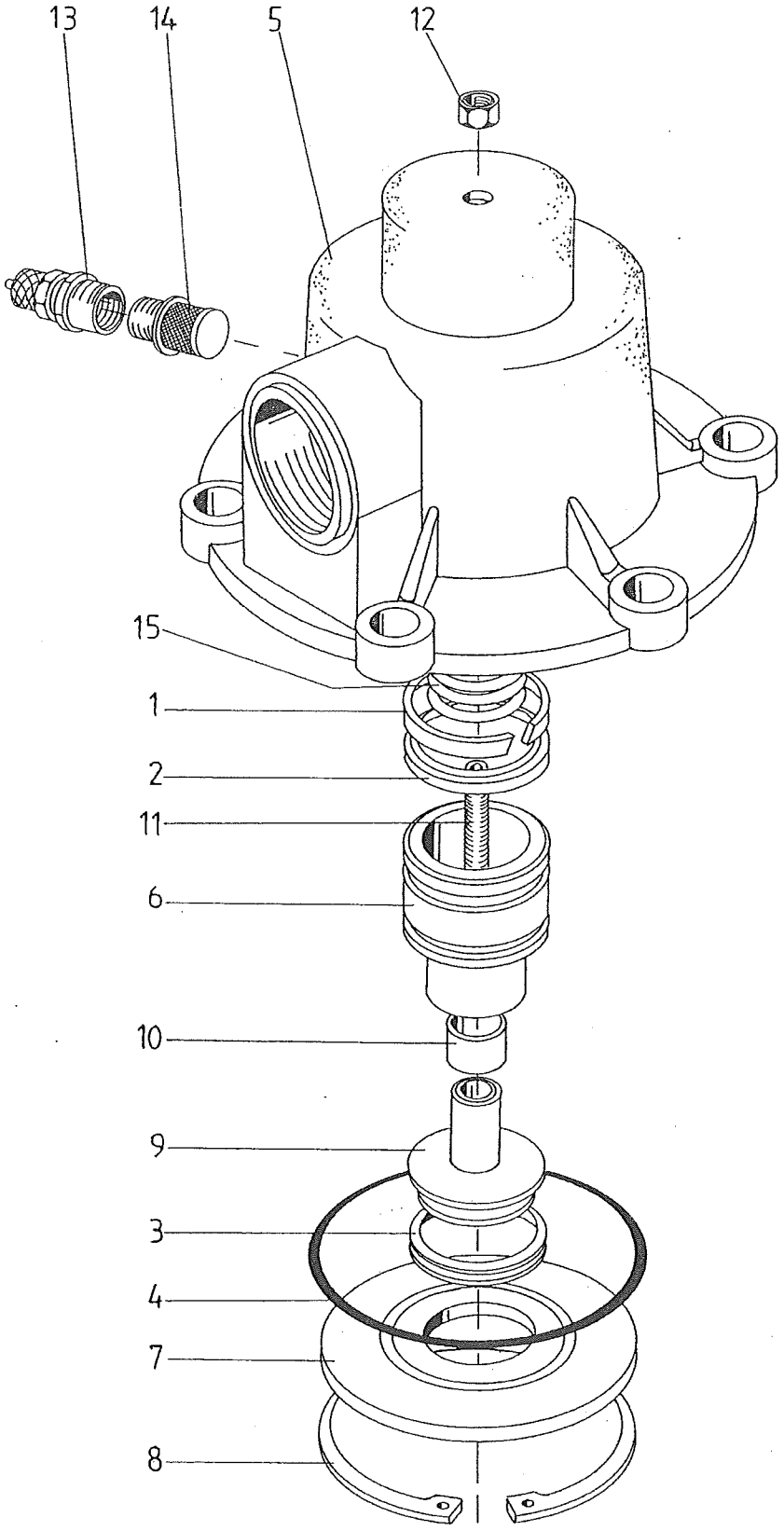
Note! Different oil qualities must never be mixed together

Varaosat
Reservdelar
Spare parts

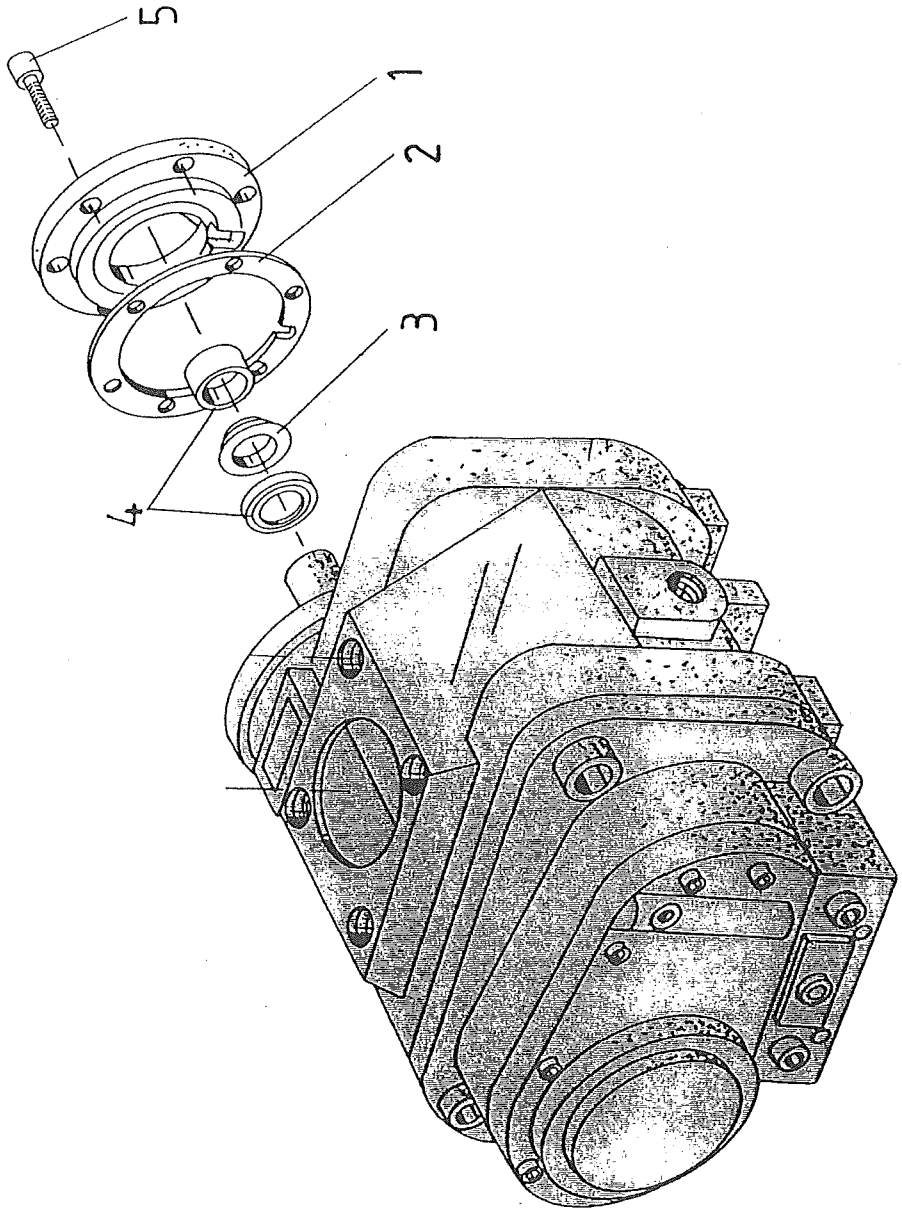
Tempest 6


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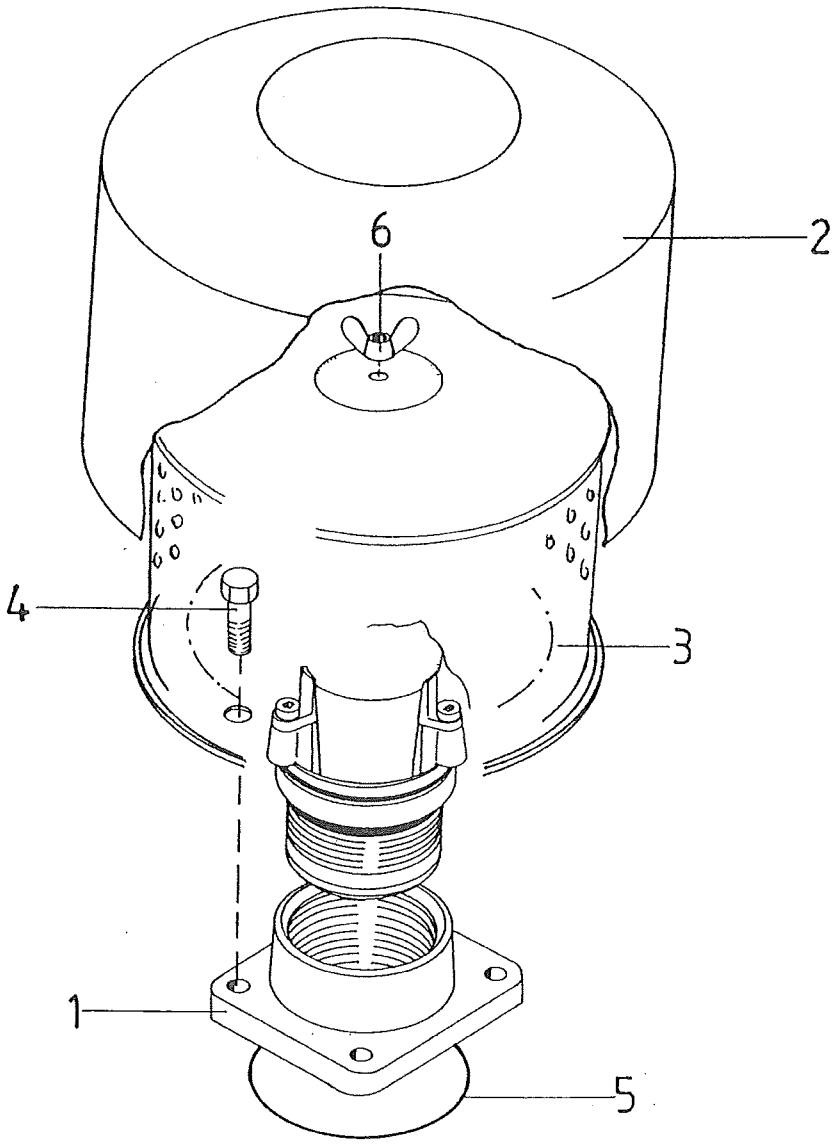
Viite N:o Det.Nr Ref.No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys	Benämning	Description
	039 811 21		**TEMPEST 6 ilmajäähdytteinen**	**TEMPEST 6 luftkyld**	**TEMPEST 6 air cooled**
1	895 601 69	1	Termostaattielementti	Termostatelement	Thermostat element
	039 811 22		**TEMPEST 6 vesijäähdytteinen**	**TEMPEST 6 vattenkyld**	**TEMPEST 6 water cooled**
1	309 186 88	1	Sulkukappale	Spärrdel	Lock piece
			Yhteiset osat	**Standard delar**	**Standard parts**
2	040 284 58	1	Sykloni	Cyklon	Cyclone
3	039 812 58	1	Suodattimen runko	Filter ram	Filter frame
4	034 983 28	1	Öljynerotin	Oljeavskiljare	Oil separator
5	376 223 38	1	Syklonputki	Cyklonrör	Cyclone tube
6	376 410 08	1	Imuputki	Sugrör	Suction tube
7	376 222 08	1	Termostaatin sylinteri	Termostatcylinder	Thermostat cylinder
8	308 995 78	1	Öljyntarkistuslasi	Oljekontrollglas	Oil checking glass
9	309 151 18	1	Mutteri	Mutter	Nut
10	309 323 08	1	Kaksoisnippa	Duppelnippel	Double nipple
11	033 811 78	7	Täyttötulppa	Plugg	Plug
12	800 347 99	8	Tiiviste	Tätning	Gasket
13	309 414 48	1	Nippa	Nippel	Nipple
14	855 886 19	1	Suodin	Filter	Filter
15	852 672 19	2	Kulmaliitin	Vinkelförbindning	Elbow
16	308 954 08	2	Kuristushylsy	Strypning	Orifice
17	852 002 99	1	Muoviputki	Plaströr	Plastic pipe
18	895 977 79	1	Vastaventtiili	Kontrastventil	Non-return valve
19	040 283 28	1	Runko	Ram	Frame
20	897 285 59	1	Varoventtiili	Säkerhetsventil	Safety valve
21	036 030 78	1	Tuottoventtiili kok.p.	Ventil smst.	Discharge valve assy
22	853 280 79	1	Kuusiokolotulppa	Insexkantplugg	Hex.socket plug
23	895 946 19	1	O-rengas	O-ring	O-ring
24	895 945 99	1	O-rengas	O-ring	O-ring
25	853 879 79	1	O-rengas	O-ring	O-ring
26	895 739 39	1	O-rengas	O-ring	O-ring
27	856 462 99	1	O-rengas	O-ring	O-ring
28	895 944 69	1	O-rengas	O-ring	O-ring
29	895 347 89	1	O-rengas	O-ring	O-ring
30	895 947 49	6	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
31	895 363 99	2	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
32	445 726 70	7	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
33	895 585 19	2	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
34	802 421 59	6	Kuusioruuvi	Sexkantskruv	Hex.screw
35	807 047 79	8	Kuusiokolotulppa	Insexkantplugg	Hex.socket plug
36	309 342 98	1	Pidin	Hållare	Holder
37	896 754 29	1	Öljynsuodatin	Oljefilter	Oil filter


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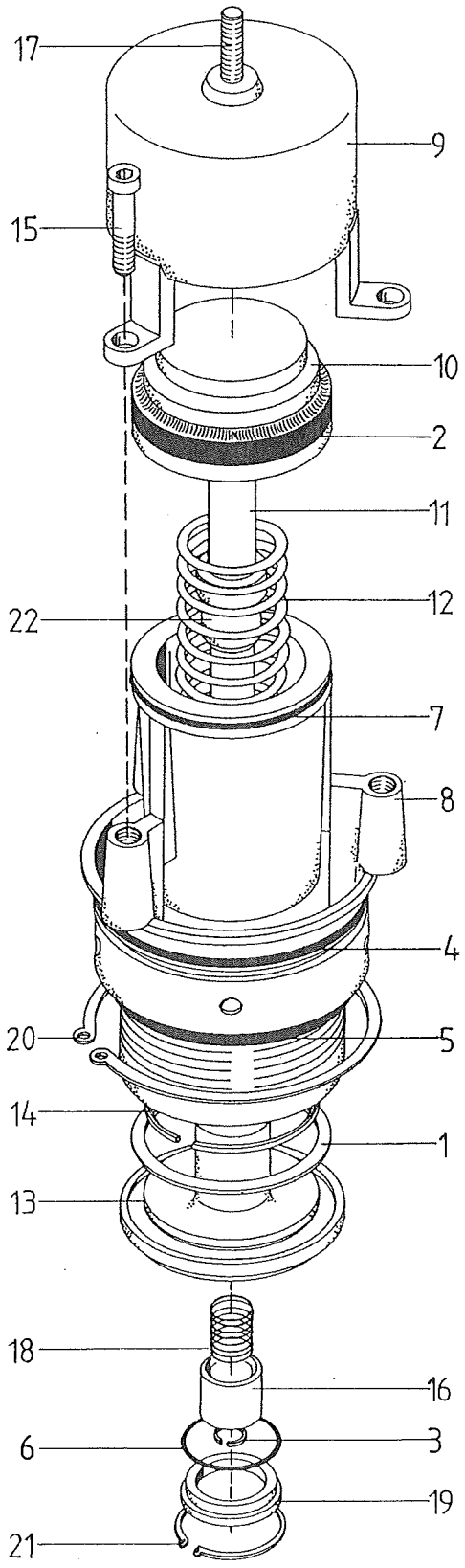
Viite N:o Det.Nr Ref.No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys	Benämning	Description
	036 030 78		**TUOTTOVENTTIILI**	**UTLOPPSVENTIL**	**DISCHARGE VALVE**
	033 892 70		Tiivistesarja kok.p. (sis.osat 1-4)	Tätningssats smst. (Delar 1-4)	Seal kit assy (Items 1-4)
	895 555 99		Korjaussarja kok.p. (sis.osat 1-4,10,15)	Reparationssats smst. (Delar 1-4,10,15)	Repair kit assy (Items 1-4,10,15)
1		1	Liukurengas	Släpring	Slide ring
2		1	Männäntiiviste	Kolvtätning	Piston gasket
3		1	Lautasen tiiviste	Tallrikstätning	Plate gasket
4		1	O-rengas	O-ring	O-ring
5		1	Runko	Ram	Frame
6		1	Mäntä	Kolv	Piston
7		1	Vastin	Tryckring	Thrustring
8		1	Lukkorengas	Låsring	Lock ring
9		1	Lautanen	Tallrik	Plate
10		1	Liukulaakeri	Lager	Bearing
11		1	Pidätinruuvi	Stoppskruv	Set screw
12		1	Mutteri	Mutter	Nut
13	033 985 78	1	Liitin	Förbindning	Connector
14	855 886 19	1	Suodatin	Filter	Filter
15		1	Jousi	Fjäder	Spring


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Viite N:o Det.Nr Ref.No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys	Benämning	Description
	040 223 74		**KOMPRESSORI-YKSIKKÖ**	**KOMPRESSOR-ENHET**	**COMPRESSOR AIR END**
1	037 918 28	1	Tiivistekansi	Tätningslock	Seal cover
2	308 096 58	1	Tiiviste	Tätning	Gasket
3	308 062 18	1	Suojarengas	Skyddsring	Protection ring
4	308 340 20	1	Akselitiiviste kok.p.	Axeltätning smst.	Shaft seal assy
5	445 774 60	6	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw


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Viite N:o Det.Nr Ref.No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys	Benämning	Description
			ILMANSUODATIN	**LUFTFILTER**	**AIRFILTER**
1	223 379 08	1	Muunnoslaippa	Fläns	Flange
2	223 467 68	1	Suodatinkotelo	Filterhus	Filter housing
3	811 666 09	1	Suodatinelementti	Filterelement	Filter element
4	800 460 49	4	Kuusioruuvi	Sexkantskruv	Hex.screw
5	895 529 79	1	O-rengas	O-ring	O-ring
6	802 200 59	1	Siipimutteri	Vingmutter	Wing nut


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Viite N:o Det.Nr Ref.No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys	Benämning	Description
	036 020 68		**IMUVENTTIILI**	**SUGVENTIL**	**AIR INLET VALVE**
	033 875 38		Tiivistesarja (osat 1, 2, 4–7)	Tätningssats (delar 1, 2, 4–7)	Seal kit (items 1, 2, 4–7)
	895 552 09		Korjaussarja (osat, delar, items 1–7, 9, 12, 16, 18, 22)	Reparationssats	Repair kit
	376 874 78		Työkalu	Verktyg	Tool
1		1	Tiiviste	Tätning	Gasket
2		1	Tiiviste	Tätning	Gasket
3		1	Lukkorengas	Låsring	Lock ring
4		1	O–rengas	O–ring	O–ring
5		1	O–rengas	O–ring	O–ring
6		1	O–rengas	O–ring	O–ring
7		1	O–rengas	O–ring	O–ring
8		1	Runko	Ram	Frame
9		1	Kansi	Lock	Cover
10		1	Mäntä	Kolv	Piston
11		1	Männänvarsi	Kolvstång	Piston rod
12		1	Jousi	Fjäder	Spring
13		1	Lautanen	Tallrik	Plate
14		1	Pidätinrengas	Stoppring	Retaining ring
15		3	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
16		1	Laakeriholkki	Lager bussning	Bearing bushing
17		1	Ruuvi	Skruv	Screw
18		1	Jousi	Fjäder	Spring
19		1	Tulppa	Plugg	Plug
20		1	Lukkorengas	Låsring	Lock ring
21		1	Pidätinrengas	Stoppring	Retaining ring
22		1	Liukulaakeri	Lager	Bearing

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Gardner Denver

TAMROTOR Compressors

Enduro 12
Repair instructions

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Before starting the compressor 1
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To the user

Enduro air end is an oil injected single stage screw, which is designed for industrial air compressors.

Each Enduro air end is designed for its own capacity range.

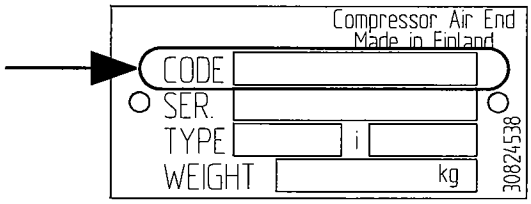
Don't exceed the max. pressure, power and rotation speed and don't use lower than the minimum rotation speed given in the technical data. The warranty of the air end is not valid if these values are exceeded.

Only the use of original spare parts guarantees long and reliable lifetime.

This instruction makes you acquainted with the repair of Enduro air end.

Read these instructions carefully before starting the repair work.

When ordering spare parts, please, give the codenumber from the plate connected to the air end.



Safety

Read always the safety instructions of the equipment, where the air end is used!

The cleanness in all repair work is of great importance. All the foreign particles in the air end shorten the life time of the bearings and the rotors.

Before starting the repair work

1. Disconnect the electric supply.
   (in diesel driven compressors take care that the motor cannot be started)
2. Make sure that there is no pressure in the oil receiver and close the valve between the compressor and the air line.
3. The air end and oil is hot immediately after the compressor has been stopped. Give time for cooling.

Before starting the compressor

1. Assure that the oil used is correct (see oil recommendation), and that the oil level is correct.
2. Make sure that the rotation direction is correct by starting the compressor momentarily. Max starting time 2 seconds.

⚠ **Running the compressor unit in the wrong direction causes damage.**

Technical data

Rotor size		
- male ϕ	mm	120
- female ϕ	mm	95,1
Lobe combination		4/5
Male rotor driven		
Displacement volume	l/rev	1,2191
Male rotor speed		
- min	rpm	1820
- max	rpm	6300
Tip speed (male)		
- min	m/s	11
- max	m/s	40
Input power		
- max	kW	45
Working pressure		
- min	bar	3
- max	bar	13
Oil injection quantity	l/min	50 - 70
Weight	kg	about 56

On the repairing of the compressor air end use always special tools.

Disassembly

1. Clean the outside surfaces of the compressor unit from all dirt.
2. Place the compressor unit on a steady surface where the repair work can be carried out.
3. Remove the output end cover(18) mounting screws(24 and 25), and remove the cover.
4. Remove the sealing housing cover(2) screws(1), and remove the cover.
5. Mount a special tool to the drive shaft and lock it to the compressor unit body.
6. Open the shaft nuts(17 and 23) and make sure that the special tool prevents the shaft from turning. Use special tool. Do not use pneumatic impact tool.
7. Remove the pressure flange(13) mounting screws(20).
8. Remove the tool mounted to the drive shaft.
9. Remove the pressure flange by using the threads in the flange.
   (In older models remove the pressure flange by lightly tapping the drive shaft with a copper drift.
   Note! Do not use a screw driver to pry off the flange.)
10. Remove the rotors from the body.
    Note! Handle the rotors with care.
11. Note the positions of the ball bearings(15 and 22).
12. Remove the outer bearing races (tap out with a drift) from the bearing housings.
    Note! A puller must be used for the bearing(9).
13. Remove the inner ring(5) of the shaft seal (warm up to about 100 ... 150 °C).
14. Use a puller to remove the inner races of the bearings, or place the rotor vertically and quickly heat up the race to make it fall off.
15. Remove the shaft seal(6) from its housing.

Inspection and repair of components

1. Wipe and wash all components thoroughly clean.
2. Check the parts:

Part	Do not reuse if
Rotors	- ends have seizure marks
	- contact surface marks are uneven
	- rotors have scratches or dents
	- bearing seats are worn
	- rotors have touched body or end flanges
Body	- rotors have touched body
	- body shows signs of overheating (blue colour)
Discharge flange	- flange shows signs of overheating (blue colour)
	- rotors have touched flange
	- O-ring groove is damaged

3. Always fit new bearings and sealings.
   Use original spare parts.

Assembly

1. Install the bearings(7 and 9) to the body.
   Use Loctite 601 to lock the bearings in place and use assembling tool.
   Lubricate the bearings.
2. Using the special installing tool, mount the inner races of the bearings(14 and 21, and 7 and 9) onto the rotors (warm up the races to about 100 °C). Use Loctite 601.
3. Insert the rotors into the body and lock the drive shaft with the special tool.
4. Install the bearings(14 and 21) to the pressure flange. Use special tool.
   Use Loctite 601 to lock the bearings in place.
   Lubricate the bearings.
5. Use grease when installing the O-rings(12 and 19) into their grooves. Mount the pressure flange.
6. Install the pins(11, 2 pcs) to the pressure flange.
7. Tighten the screws(20) to 180 Nm.
   Tighten crosswise.
8. Install the pressure flange ball bearings(15 and 22). Use special tool.
   Note! Thick side of inner race upwards.
9. Install the shaft nuts(17 and 23) with their own tools.
   Apply Molykote 1000 to the threads.

10. Adjust end float:
    - Tighten the shaft nuts lightly so that the clearance between the rotor ends and the pressure flange disappears. Do not overtighten.
    - Open the nuts (approx. 8 - 12°) so that the clearance between the rotor ends and the pressure flange is 0.03 to 0.05 mm. Move the rotors up and down to measure the clearance. Use a dial gauge. Note that the shaft nuts need no separate locking.

11. Mount the output end cover(18) with the sealing(16), and tighten the screws(24 and 25) to 25 Nm.

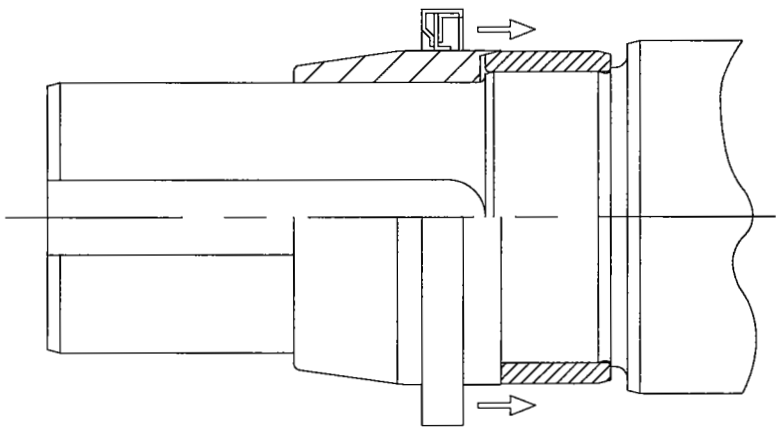
12. Install the dust ring(4) and the shaft seal(6) into the sealing housing(2).
    Use Loctite 542.
    Note! The shaft seal lip should face inwards.

13. Apply an approx. 10 mm band of Loctite 601 to where the shaft seal inner sleeve will be located on the shaft. Warm up the inner sleeve(5) to about 150 °C. Use the installing tool to mount the warmed-up sleeve on the shaft.

14. Install the shaft seal mounting tool into the rotor axle against the shaft seal inner ring and install the sealing housing carefully into its position (see drawing). Remember also to install the sealing.
    Note! The oil hole from the body to the sealing housing must be open.

15. Tighten the sealing housing screws(1) to 25 Nm.

16. Pour in some oil through the intake and rotate the drive shaft a few times. Plug and seal all openings. Protect the drive shaft against corrosion.



Lubricants and tools that you need

Lubricants

Lubricating oil	SAE 10W
Grease	Molykote 1000

Cement

Cement	Loctite 601
Cement	Loctite 542

Mounting tool set

Mounting tool set for Enduro 12 compr. unit 308 365 88

bearing inner race mounting tools:
- inlet end, male rotor roller bearing
- inlet end, female rotor roller bearing
- discharge end, male rotor bearings
- discharge end, female rotor bearings

bearing mounting tools to body:
- inlet end, male rotor roller bearing
- inlet end, female rotor roller bearing

bearing mounting tools to pressure flange:
- male rotor roller bearing
- female rotor roller bearing

special tool for locking rotors

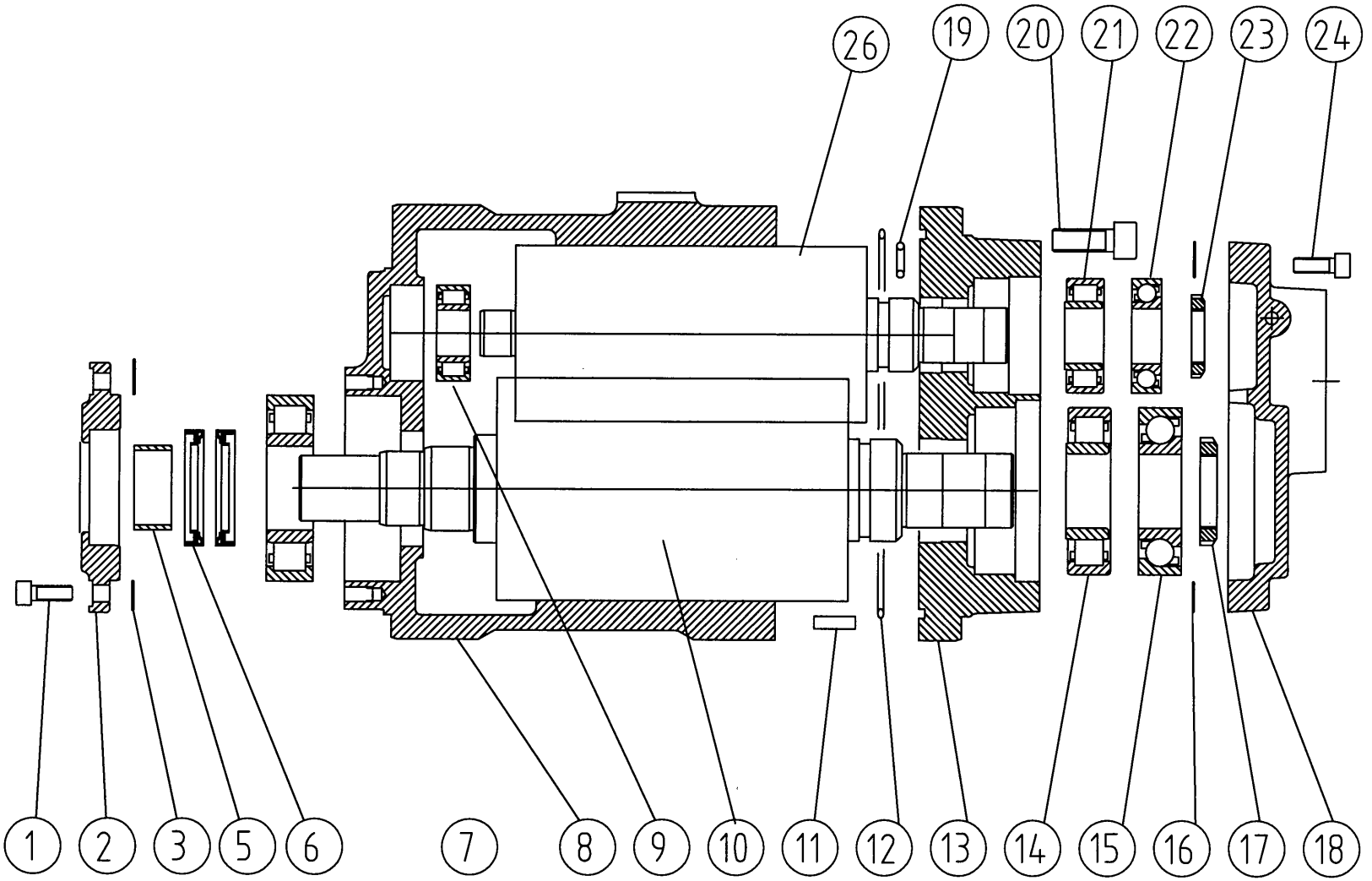
drift for pins

lock nut wrench:
- male rotor
- female rotor

mounting tool for shaft seal inner ring	379 178 18
shaft seal mounting bushing	034 247 08
shaft seal mounting tool	034 160 08

Varaosat
Reservdelar
Spare parts

Enduro 12
505 533 71


26
19
20
21
22
23
24
1
2
3
5
6
7
8
9
10
11
12
13
14
15
16
17
18

Viite N:o Det.Nr Ref.No	Tilaus N:o Reservdel Nr Order No	Kpl Antal Qty	Nimitys Benämning Description		23.10.2003
	505 533 71		**KOMPRESSORI-YKSIKKÖ**	**KOMPRESSOR-ENHET**	**COMPRESSOR AIR END**
			Yhteiset osat	Standard delar	Standard parts
1	446 110 40	6	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
2	037 867 17	1	Tiivistekansi	Tätningslock	Seal cover
3	308 059 08	1	Tiiviste	Tätning	Gasket
6	308 340 27	1	Akselitiiviste kok.p. sisältää osan 5	Axeltätning smst. innehåller delen 5	Shaft seal assy include item 5
7	801 075 99	1	Rullalaakeri	Rullager	Roller bearing
8	040 189 68	1	Runko	Rotorhus	Rotor casing
9	870 893 59	1	Rullalaakeri	Rullager	Roller bearing
10	038 544 42	1	Ruuviroottori	Skruvrotor	Male rotor
11	815 318 69	2	Jousisokka	Fjäderpinne	Spring pin
12	870 900 19	1	O-rengas	O-ring	O-ring
13	040 188 38	1	Painelaippa	Avloppsgavel	Discharge cover
14	801 076 19	1	Rullalaakeri	Rullager	Roller bearing
15	874 569 49	1	Kuulalaakeri	Kullager	Ball bearing
16	223 187 08	1	Tiiviste	Tätning	Gasket
17	869 128 99	1	Akselimutteri	Axelmutter	Lock nut
18	039 647 68	1	Lähtökansi	Avloppskupa	Outlet cover
19	879 088 49	2	O-rengas	O-ring	O-ring
20	801 471 99	4	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
21	870 894 89	1	Rullalaakeri	Rullager	Roller bearing
22	874 572 69	1	Kuulalaakeri	Kullager	Ball bearing
23	872 525 89	1	Akselimutteri	Axelmutter	Lock nut
24	800 592 59	9	Kuusiokoloruuvi	Insexkantskruv	Hex.socket screw
26	038 545 78	1	Luistiroottori	Slidrotor	Female rotor
*	503 083 30	1	Korjaussarja (sisältää osat / innehåller delar / include parts 3, 6, 7, 9, 11, 12, 14-17, 19, 21-23)	Reparationssats	Repair kit

FOAMLOGIX INSTALLATION AND OPERATION MANUAL

For FoamLogix 2.1

For FoamLogix 3.3
FoamLogix 5.0
FoamLogix 6.5

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FoamLogix™

Model 2.1A and 1.7AHP Class "A" Electronic Foam Proportioning Systems **Description, Installation and Operation Manual**

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Tianjin High-Tech Industrial Park Tianjin China
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FAX: 011-862285689808

Manual p/n: 029-0020-74-0-E

APPARATUS INFORMATION

Hale FoamLogix System Serial Number _____

In Service Date _____

Fire Department _____

Engine Number _____

Calibration Factors:

Water Flow Factor _____

Class A Foam Factor _____

NOTICE!

Hale Products does not assume responsibility for product failure resulting from improper maintenance or operation. Hale Products is responsible only to the limits stated in the product warranty. Product specifications contained in this manual are subject to change without notice.

All Hale products are quality components -- ruggedly designed, accurately machined, precision inspected, carefully assembled and thoroughly tested. In order to maintain the high quality of your unit, and to keep it in a ready condition, it is important to follow the instructions on care and operation. Proper use and good preventive maintenance will lengthen the life of your unit.

ALWAYS INCLUDE THE UNIT SERIAL NUMBER IN YOUR CORRESPONDENCE.

ECO NO	REV	CHANGED FROM	BY	DATE	APVD
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	E	CHANGE INFO ON FOAM FLOW SENSOR REPLACEMENT	RLL	8/10/09	DC

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HOW TO USE THIS MANUAL

This manual is divided into seven sections for clarity and ease of use. Each of the following manual sections can be a stand alone section or can be used in conjunction with each other.

SECTION 1 SAFETY

This section must be carefully read, understood and adhered to strictly by all installer/builders, operators and service personnel using the Hale FoamLogix 2.1A and 1.7AHP Foam Proportioning Systems. Do not use or install the system until you have thoroughly read this section. Failure to comply could cause risk of serious injury to yourself and others, or damage to the system.

SECTION 2 DESCRIPTION

Provides an introduction to the Hale foam proportioning system along with guidelines for designing and ordering a complete system.

SECTION 3 INSTALLATION

Provides information to assist the OEM with installation and initial setup of Hale foam proportioning systems on an apparatus.

SECTION 4 SETUP AND CALIBRATION

Is used by the installer and end user for start-up and calibration of the Hale foam proportioning system.

SECTION 5 OPERATION

Is primarily used by the apparatus user for proper operation and maintenance of the Hale foam proportioning system.

SECTION 6 TROUBLESHOOTING

If a problem developes, see this section for troubleshooting procedures.

SECTION 7 PARTS IDENTIFICATION

Section 7 includes a parts breakdown of the most commonly used parts of the FoamLogix System.

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SECTION 1 SAFETY



IMPORTANT!

THE HALE "FOAMLOGIX™" MODELS 2.1A AND 1.7AHP CLASS "A" ELECTRONIC FOAM PROPORTIONING SYSTEMS ARE DESIGNED FOR OPTIMUM SAFETY OF ITS OPERATORS AND TO PROVIDE RELIABLE AND SAFE FOAM CONCENTRATE INJECTION. FOR ADDED PROTECTION AND BEFORE ATTEMPTING INSTALLATION OR OPERATION PLEASE FOLLOW THE SAFETY GUIDELINES LISTED IN THIS SECTION AND ADHERE TO ALL WARNING, DANGER, CAUTION AND IMPORTANT NOTES FOUND WITHIN THIS GUIDE.

THIS SECTION ON SAFETY MUST BE CAREFULLY READ, UNDERSTOOD AND ADHERED TO STRICTLY BY ALL INSTALLERS AND OPERATORS BEFORE ATTEMPTING TO INSTALL OR OPERATE THE FOAMLOGIX PROPORTIONING SYSTEM.

WHEN DEVELOPING DEPARTMENTAL APPARATUS OPERATING PROCEDURES, INCORPORATE THE WARNINGS AND CAUTIONS AS WRITTEN.

FoamLogix is a trademark of Hale Products, Incorporated. All other brand and product names are the trademarks of their respective holders.

GUIDELINES

READ ALL INSTRUCTIONS THOROUGHLY BEFORE BEGINNING ANY INSTALLATION OR OPERATION PROCESS.

- ❑ Installation should be performed by a trained and qualified installer, or your authorized Hale Products service representative.
- ❑ Be sure the installer has sufficient knowledge, experience and the proper tools before attempting any installation.
- ❑ Make sure proper personal protective equipment is used when operating or servicing apparatus.
- ❑ A foam tank low level sensor must be utilized to protect the Hale Foam proportioner from dry running. *Failure to use a low level sensor with the Hale Foam system voids warranty.*
- ❑ DO NOT permanently remove or alter any guard or insulating devices, or attempt to operate the system when these guards are removed.
  Make sure all access/service panels and covers are installed, closed and latched tight, where applicable.
- ❑ DO NOT remove or alter any hydraulic or pneumatic connections, electrical devices, etc. DO NOT tamper with or disconnect safety features or modify protective guards (such as covers or doors). DO NOT add or remove structural parts. *Doing so voids the warranty.*

  Any of the above could affect system capacity and/or safe operation of the system and is a serious safety violation which could cause personal injury, could weaken the construction of the system or could affect safe operation of the FoamLogix Proportioning System.

WARNING!

NO MODIFICATIONS OR ADDITIONS MAY BE MADE TO THE FOAMLOGIX PORPORTIONING SYSTEM WITHOUT PRIOR WRITTEN PERMISSION FROM:

Hale Products, Incorporated
700 Spring Mill Avenue
Conshohocken, PA 19428
Telephone: 610-825-6300
Fax: 610-825-6440

- ❑ To prevent electrical shock always disconnect the primary power source before attempting to service any part of the Hale Foam system.

- ❑ All electrical systems have the potential to cause sparks during service. Take care to eliminate explosive or hazardous environments during service and/or repair.
- ❑ To prevent system damage or electrical shock the main power supply wire is the last connection made to the Hale Foam proportioner distribution box.
- ❑ Release all pressure then drain all concentrate and water from the system before servicing any of its component parts.
- ❑ Do not operate system at pressures higher than the maximum rated pressure.
- ❑ Use only pipe, hose, and fittings from the foam pump outlet to the injector fitting, which are rated at or above the maximum pressure rating at which the water pump system operates.
- ❑ Hale Foam proportioning systems are designed for use on negative ground direct current electrical systems only.
- ❑ Do not mount radio transmitter or transmitter cables in direct or close contact with the FoamLogix control unit.
- ❑ Before connecting the cord sets and wiring harnesses, inspect the seal washer in the female connector. If the seal washer is missing or damaged, water can enter the connector causing corrosion of the pins and terminals. This could resulting in possible system failure.
- ❑ Always disconnect the power cable, ground straps, electrical wires and control cables from the control unit or other Hale Foam system equipment before electric arc welding at any point on the apparatus Failure to do so could result in a power surge through the unit that could cause irreparable damage.
- ❑ DO NOT connect the main power lead to small leads that are supplying some other device, such as a light bar or siren.

The Hale FoamLogix, Models 2.1A and 1.7AHP require 40 AMP minimum current.

- ❑ When operating the Hale FoamLogix in Simulated Flow mode, an outlet for the foam concentrate must be provided to prevent excessive pressure buildup in the discharge piping or hoses.
- ❑ Make sure the foam tank and foam concentrate suction hoses are clean before making final connection to foam pump. If necessary flush tank and hoses prior to making connection.
- ❑ Check all hoses for weak or worn conditions after each use. Ensure that all connections and fittings are tight and secure.
- ❑ Ensure that the electrical source of power for the unit is a negative (–) ground DC system, of correct input voltage, with a reserve minimum current available to drive the system.
- ❑ The in-line strainer/valve assembly is a low pressure device and WILL NOT withstand flushing water pressure in excess of 45 PSI (3 BAR).
- ❑ When determining the location of Hale Foam system components keep in mind piping runs, cable routing and other interferences that could hinder or interfere with proper system performance.
- ❑ Always position the check valve/injector fitting at a horizontal or higher angle to allow water to drain away from the fitting. This avoids the possibility of sediment deposits or the formation of an ice plug.
- ❑ The cord sets provided with each Hale Foam system are indexed to ensure correct receptacle installation (they insert one way only). When making cord set connections DO NOT force mismatched connections as damage can result in improper system operation.
- ❑ Make sure all connections are sound, and that each connection is correct.
- ❑ The cables shipped with each Hale Foam system are 100% tested at the factory with that unit. Improper handling and forcing connections can damage these cables which could result in other system damage.

- ❑ There are no user serviceable parts inside Hale Foam system electrical/electronic components. *Opening of the distribution box or control unit voids the warranty.*
- ❑ Use mounting hardware that is compatible with all foam concentrates to be used in the system. Use washers, lock washers and cap screws made of brass or 300 series stainless steel.
- ❑ When making wire splice connections, make sure they are properly insulated and sealed using an adhesive filled heat shrink tubing.
- ❑ ALWAYS connect the primary positive power lead from the terminal block to the master switch terminal or the positive battery terminal. Use a minimum 8 AWG type SGX (SAE J1127) chemical resistant battery cable and protect with wire loom.
- ❑ Prevent corrosion of power and ground connections by sealing these connections with silicone sealant provided.
- ❑ Prevent possible short circuit by using the rubber boot provided to insulate the primary power connection at the Hale FoamLogix distribution box.

NOTES

SECTION 2 DESCRIPTION

The Hale FoamLogix 2.1A and 1.7AHP Foam Proportioning Systems are completely engineered, factory matched foam proportioning systems that provides reliable, consistent foam concentrate injection for Class “A” foam operations.

Hale FoamLogix Foam systems accurately deliver from 0.1% to 10.0% (up to the capacity of the foam pump) foam concentrate through a check valve/ injector fitting, directly into the water discharge stream. It is then fed as foam solution into a standard fog nozzle, an air aspirated nozzle, or CAFS equipment, through the apparatus discharge piping. A properly configured and installed foam system with Hale recommended components virtually eliminates contamination of the booster tank, fire pump and relief valve with foam concentrate.

ROTARY PLUNGER PUMP

The heart of the Hale FoamLogix 2.1A and 1.7AHP systems are an electric motor driven rotary plunger pump. The pump is constructed of anodized aluminum and stainless steel and is compatible with most Class “A” foam concentrates. The pump is close coupled to the electric motor thereby eliminating maintenance of an oil filled gearbox. A relief valve mounted on the foam pump and constructed of brass, protects the foam pump and foam concentrate discharge hoses from over pressurization and damage.

CONTROL UNIT

The control unit, mounted on the operator panel, is the single control point for the FoamLogix system. Pressing the ON button starts foam concentrate injection. A super bright digital LED display shows the:

- ❑ Water flow rate
- ❑ Total water flow
- ❑ Foam concentrate injection percentage
- ❑ Total foam concentrate used, depending on the display mode selected.

A bar graph indicates the approximate system capacity being used. Adjustment of the foam concentrate injection rate is accomplished by pressing the appropriate button.

The control unit display also warns the operator if errors or abnormal operations occur in the system, such as low foam level.

WATER FLOW SENSOR

Foam concentrate injection rate is controlled by a computer chip in the control unit for accurate, repeatable, reliable foam concentrate injection. A water flow sensor constantly monitors water flow through the discharge piping. The information from the flow sensor is provided to the control unit by a shielded cable. When the FoamLogix system is activated at the control unit a signal is sent through the control cable to the distribution box to begin foam concentrate injection. The distribution box then provides power to the electric motor. As the motor rotates the pump, foam concentrate flows through the foam pump discharge to the one piece check valve/ injector fitting into the water discharge stream.

> **Note:** All Hale FoamLogix Foam systems require a flow sensor for operation.

FEED BACK SENSOR

A feedback sensor in the foam pump discharge measures foam concentrate flow. The water flow rate and foam concentrate flow rate are constantly compared by the computer chip in the control unit.

The motor speed is constantly adjusted to maintain the operator selected foam concentrate injection rate. Since the system is flow based, injection rate remains constant regardless of changes in system pressure or the number of discharges that are open (within the limits of the sytem).

The maximum rated foam concentrate flow, in gallons per minute, is denoted by the model number. Table 1: “Maximum Foam Solution Flows” shows the system capacity at various foam concentrate injection rates for the Hale FoamLogix 2.1A and 1.7APH units.

	Maximum Foam Solution Flow			
Injection Rate Percent (%)	Gallons per Minute (GPM)		Liters Per Minute (LPM)	
	2.1A	1.7AHP	2.1A	1.7AHP
0.1	2,100	1,700	7,949	6,426
0.2	1,050	850	3,974	3,213
0.3	700	567	2,650	2,143
0.5	420	340	1,590	1,285
1.0	210	170	795	643

Table 1: Maximum Foam Solution Flows

The Hale FoamLogix 2.1A & 1.7A Foam system configuration is shown in Figure 2-3: “Typical System Layout” on page 21.

LOW PRESSURE STRAINER

A low pressure foam concentrate strainer is mounted at the inlet of the foam pump. The strainer protects the pump from debris that might accumulate in the foam concentrate tank. The strainer/valve assembly has a composite nonmetallic housing with stainless steel mesh strainer element and includes a service shut-off valve.

The valve inlet offers 1/2” NPT (13 mm) threads, with a fitting to connect a 1/2” (13 mm) ID foam concentrate suction hose.

The strainer and valve are low pressure devices and are designed for installations where the strainer IS NOT subject to HIGH pressure flushing water.

ORDERING INFORMATION

Ordering Hale FoamLogix 2.1A and 1.7AHP Foam Systems is simple. Using the current Hale FoamLogix 2.1A Foam System Price List and Order Form helps ensure a complete matched system is provided to the end user.

Use the following procedure when ordering a Hale FoamLogix 2.1A Foam system. Following all steps to ensure that a complete system is ordered:

1. Check Hale Foam system product information update (Bulletin #961) for the latest information and advice for foam system selection.

2. Determine the Class “A” foam concentrate to be used in the system and ensure system compatibility by referring to the Hale Foam Concentrate Compatibility list (Bulletin #650).

3. Consult the current Hale FoamLogix 2.1A/ 1.7AHP Price List and Order Form for ordering of the system.

   The Hale FoamLogix 2.1A and 1.7AHP can be ordered as one of two pre-configured packages that include the pump and motor assembly, control unit, flow sensor cable, stainless steel check valve and injection manifold, and an installation kit.

   Package “A” includes the single check valve manifold.

Package "B" includes dual check valve manifold.

Note: If package "A" is selected an additional check valve is required where the foam manifold attaches to the pump discharge for NFPA compliance.

4. The Hale FoamLogix 2.1A and 1.7AHP may also be ordered "a-la-carte" if one of the standard packages does not meet end user requirements. When ordering the system "a-la-carte" for a complete system the Pump and motor assembly, flow sensor, flow sensor cable, low tank sensor and check valve injector fitting must be ordered as a minimum.

   Ordering the components as a complete system allows Hale to configure and test the complete order, to ensure a problem-free system.

5. Additional Hale components available to enhance system operation and ease installation include:

❑ Control Cable Extension
❑ Waterway Check Valves
❑ Manifolds
❑ Flanges

System components are shown in the following heading "System Configuration," beginning on page 20.

All components listed are engineered and tested with Hale Foam systems to provide optimum system performance. Using the information provided in this manual and the detailed ordering procedures on the option order form ensures that a complete Hale Foam system is ordered thus eliminating delays caused by missing components.

HALE FOAM SYSTEM SPECIFICATIONS

	2.1A	1.7AHP
Foam Pump	Dual Plunger	Dual Plunger
Maximum Foam Concentrate Output	2.1 GPM (8 LPM)	1.7 GPM (6.5 LPM)
Maximum System Operating Pressure	250 PSI (17 BAR)	400 PSI (27.5 BAR)
Maximum Operating Temperature	160° F (71° C)	160° F (71° C)
Pump Motor	0.44 HP (0.3 Kw), 12 VDC	0.44 HP (0.3 Kw), 12 VDC
Operating Ampere Draw	25 AMPS @ 12 VDC	30 AMPS @ 12 VDC
Maximum Ampere Draw	40 AMPS @ 12 VDC	40 AMPS @ 12 VDC

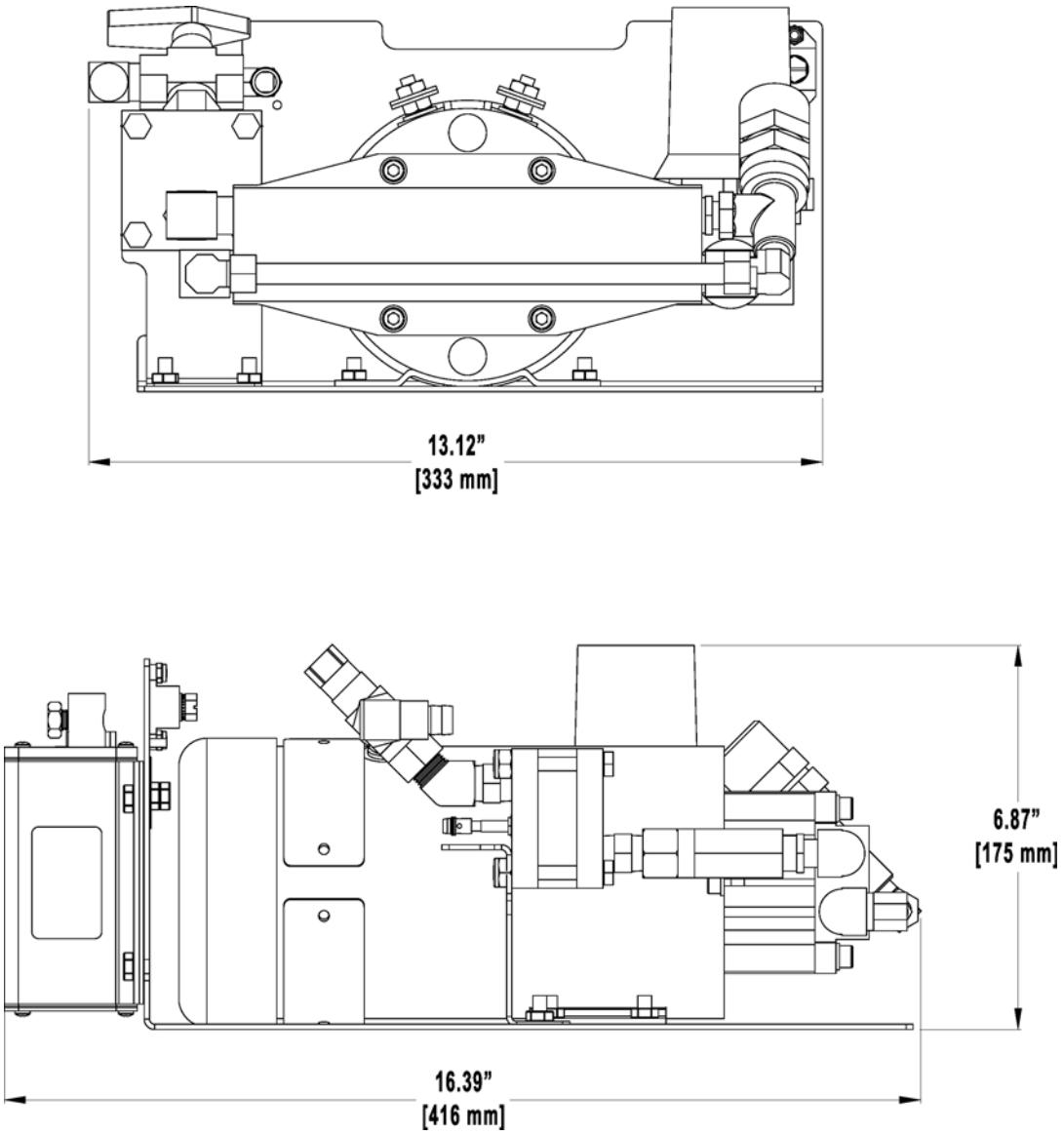


Figure 2: Foam Pump Installation Envelope Dimensions

SYSTEM CONFIGURATION

Package A

Part Number: (Choose One)

- ☐ FLX21-12-1-10-1 (2.1A 12 Volt)
- ☐ FLX21-24-1-10-1 (2.1A 24 Volt)
- ☐ FLX17-12-1-10-1 (1.7AHP 12 Volt)
- ☐ FLX17-24-1-10-1 (1.7AHP 24 Volt)

Description: FoamLogix Kit with *single* stainless steel check valve manifold

Includes the following:

(1) FoamLogix full function digital display control that displays flow, foam %, total flow and total foam
(1) Foam pump assembly with bypass and strainer service valves
(1) 15 feet of cable between display and pump and 10 feet of cable between display and flow sensor
(1) Compact foam manifold assembly with a single waterway check valve, flow sensor and foam injection check valve installed. 3 inch grooved victaulic connections
Flow range 30 - 750 GPM
Note: A second check valve is recommended to avoid pump/water tank contamination.
(1) Installation kit includes clear reinforced foam inlet hose, hose clamps, positive and ground terminal insulation kit
(2) Operation and Installation manuals
(1) Single tank system instruction placard
(1) Side mount low level tank sensor

Package B

Part Number: (Choose One)

- ☐ FLX21-12-2-10-1 (2.1A 12 Volt)
- ☐ FLX21-24-2-10-1 (2.1A 24 Volt)
- ☐ FLX17-12-2-10-1 (1.7AHP 12 Volt)
- ☐ FLX17-24-2-10-1 (1.7 AHP 24 Volt)

Description: FoamLogix Kit with *dual* stainless steel valve manifold (recommended for NFPA backflow prevention compliance):

Includes the following:

(1) FoamLogix full function digital display control that displays flow, foam %, total flow and total foam
(1) Foam pump assembly with bypass and strainer service valves
(1) 15 feet of cable between display and pump and 10 feet of cable between display and flow sensor
(1) Foam manifold assembly with dual waterway check valves, flow sensor and foam injection check valve installed. 3 inch grooved Victaulic connections
Flow range 30 - 750 GPM
(1) Installation kit includes clear reinforced foam inlet hose, hose clamps, positive and ground terminal insulation kit
(2) Operation and Installation manuals
(1) Single tank system instruction placard
(1) Side mount low level tank sensor

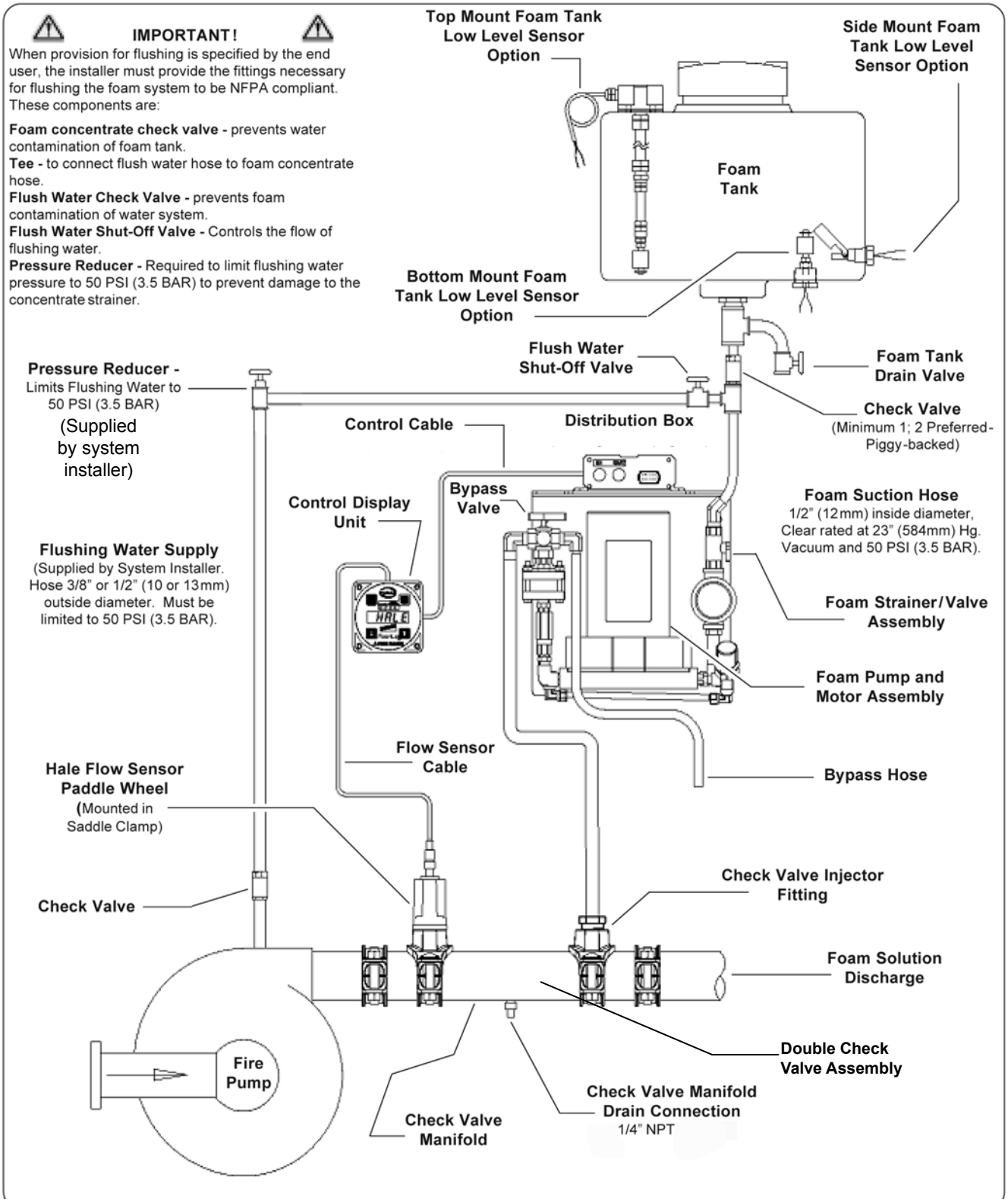
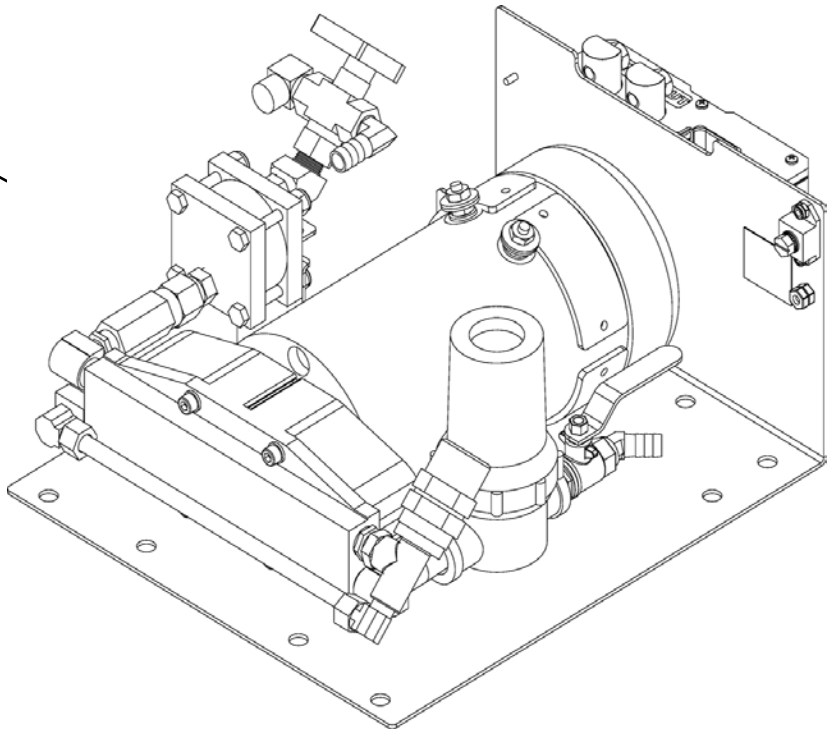


Figure 3: Typical Hale FoamLogix 2.1A and 1.7AHP System Layouts
(Also see Figure 20: "Control Harness Connections" on page 45)

Hale FoamLogix 2.1A and 1.7AHP Foam Proportioner Systems

All Hale FoamLogix 2.1A and 1.7AHP systems include: Foam Pump/Motor Assembly and Control Unit

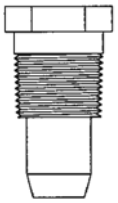
FoamLogix Base Unit,
Foam Pump/Motor Assembly
2.1A - 12V: 115498
2.1A - 24V: 115499
1.7AHP - 12V: 119276
1.7AHP - 24V: 119277





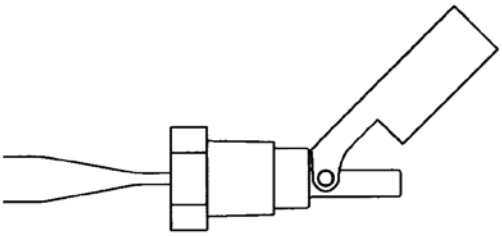
Control Display Unit p/n: 111530

Check Valve/Injector Fitting
p/n: 038-1790-00-0

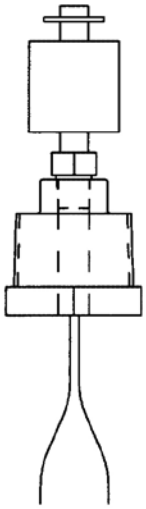


Low Tank Level Sensor Options

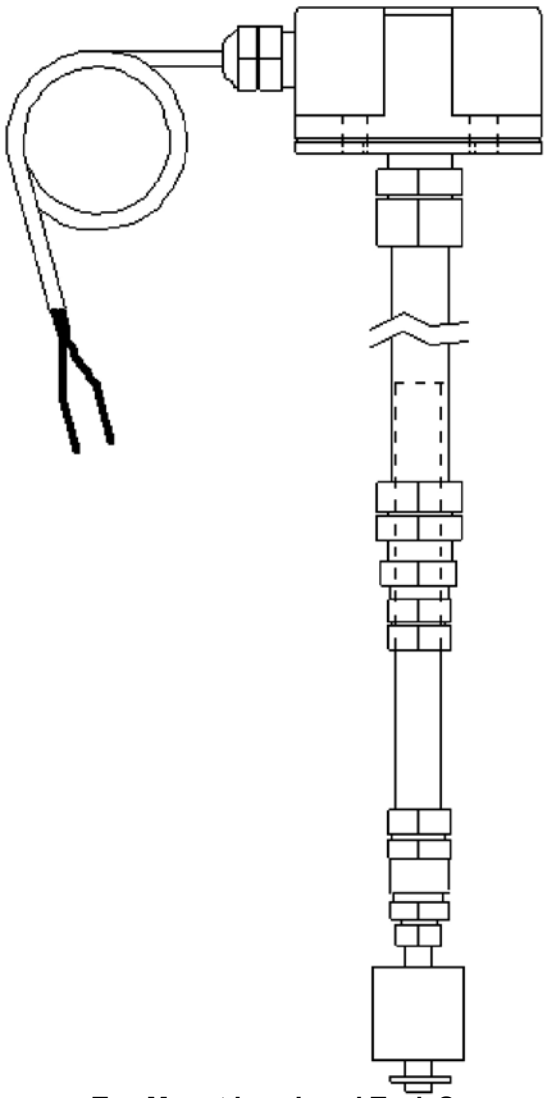
One Low Tank Level Sensor is Required



Side Mount Low Level Tank Sensor
p/n: 200-2110-02-0
(1/2" NPT threaded bushing to mount from outside foam tank.)



Bottom Mount Low Level Tank Sensor
p/n: 200-2100-04-0
(1" NPT threaded bushing to mount from outside foam tank.)



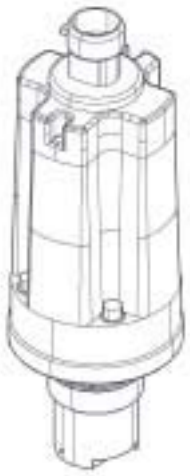
Top Mount Low Level Tank Sensor
p/n: 200-2110-06-0
(Extends from 2-1/2' to 5' (0.8 to 1.5 meters) - may be cut shorter if required.)

Flow Sensors

Each Hale foam system requires a flow sensor for operation. Pipe size must be selected based on the minimum and maximum water flow in the foam capable discharge. Following is a list of pipe size and rated flow ranges, along with flow sensor saddle clamp part number. In all instances, a weld fitting may be substituted for the saddle clamp.

Pipe Size	Flow Range	
	GPM	LPM
1.5”	10 - 350	38- 1,219
2”	20 - 550	76 - 2,082
2.5”	30 - 800	114 - 3,028
3”	50 - 1,250	189 - 4,731
4”	75 - 1,800	284 - 6,813
SCV or DCV	30 - 750	114 - 2,839

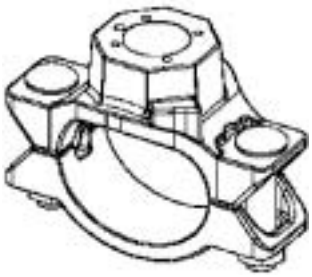
Figure 4: Pipe Size vs. Flow Range



Flow Sensor Paddle Wheel
p/n: 102714

Flow Sensor Weld Fitting
Stainless Steel, p/n: 082-3060-00-0
Steel, p/n: 309020
Aluminium, p/n: 309010

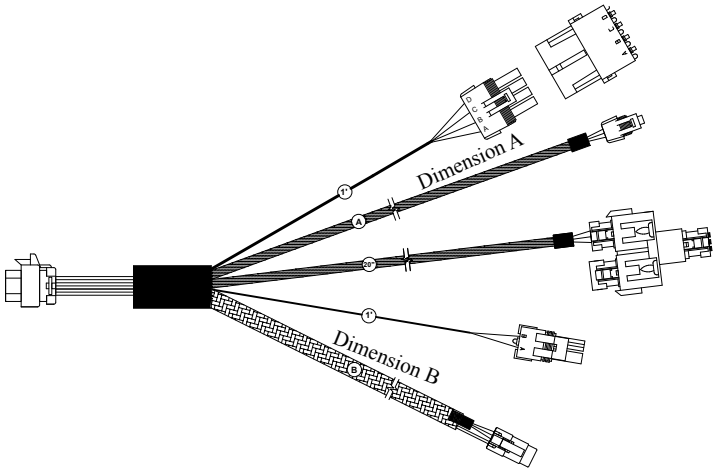




Flow Sensor Saddle Clamp

Threads (NPT) Part Number

2” – p/n: 4842010
2.5” – p/n: 4843010
3” – p/n: 4844010
4” – p/n: 4846010

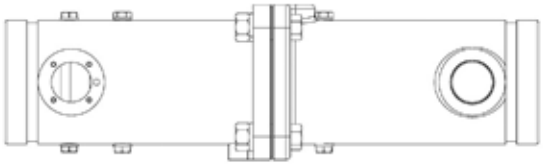


Flow Sensor Cable

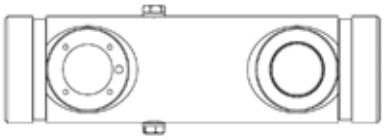
Dimension A & B	Part Number
10’ x 14’ (3.05m x 4.27m)	113438
15’ x 19’ (4.57m x 5.79m)	113439

Check Valve Manifolds, Flanges and Gaskets

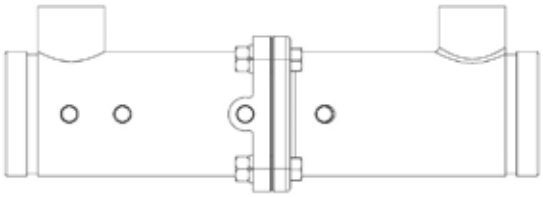
The check valve manifolds include Flow Sensor, Check Valve/Injector Fitting and Single or Dual Waterway Check Valve Flappers. End connections for the manifolds are 3" Victaulic.



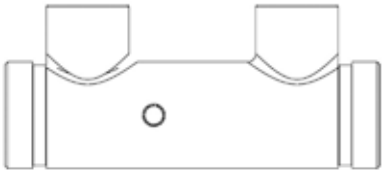
DUAL CHECK VALVE MANIFOLD - 3.0"



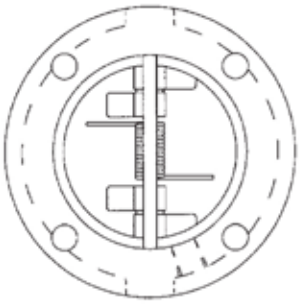
SINGLE CHECK VALVE MANIFOLD



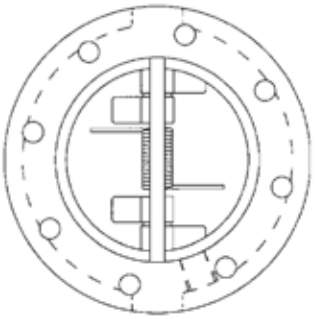
3.0" dual check Valve - p/n 108995



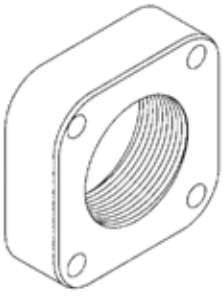
p/n 112074 (2.0") & 108966 (3.0")



3" 115 Check Valve
p/n: 038-1570-06-0

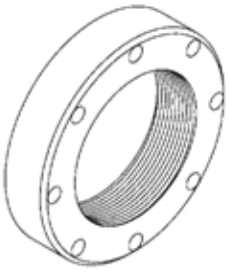


4" Wafer Check Valve
p/n 038-1570-08-0



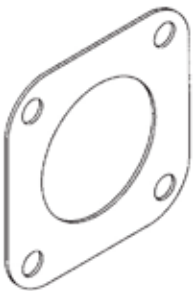
Threads (NPT)	Part Number
3"	115-0080-00-0
2.5"	115-0070-00-0
2"	115-0060-00-0
BLANK	125-0050-00-0

Threads (NPT)	Part Number
4"	115-0040-00-0
3"	115-0030-00-0
2.5"	115-0020-00-0
BLANK	115-0010-00-0



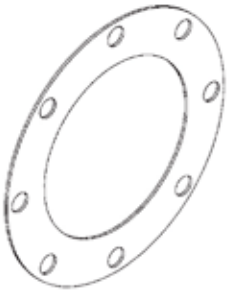
Type 115 Flange
(Use 3" and 2.5" NPT with 3" check valves.
Also available with 1.5" and 2" NPT Threads)

Type 2433D Flange
Use 4" NPT with 4" check valves
Also available with 2.5" and 3" NPT threads)

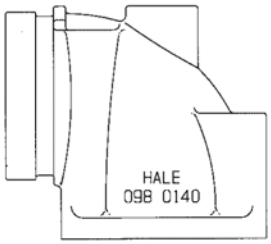


115 Flange Gasket
p/n: 046-0050-00-0

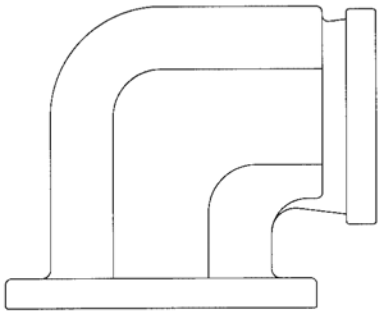
2433D Flange Gasket
p/n: 046-0040-00-0



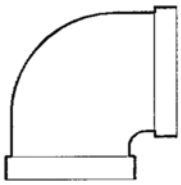
Elbows and Mini-Manifolds



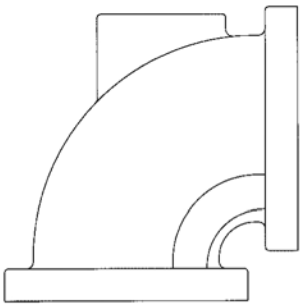
Close Fit Flanged Elbow
p/n: 098-0140-00-0
(115 flange inlet with 3" Victaulic outlet)



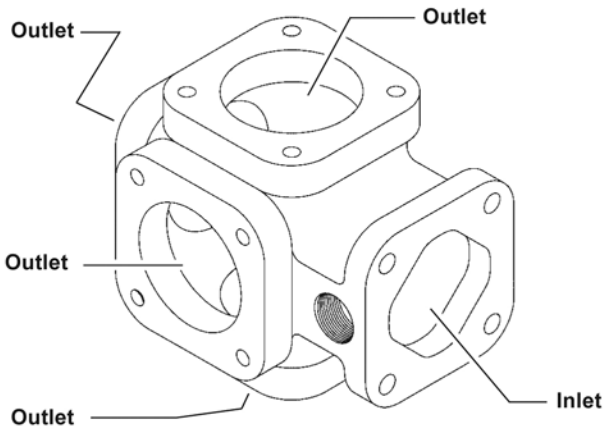
Close Fit Flanged Elbow
p/n: 098-0190-00-0
2433D flange inlet with 3" NPT female and 4" Victaulic outlet)



Close Fit Flanged Elbow
p/n: 098-0050-00-0
(115 flange inlet with 2.5" NPT female outlet)

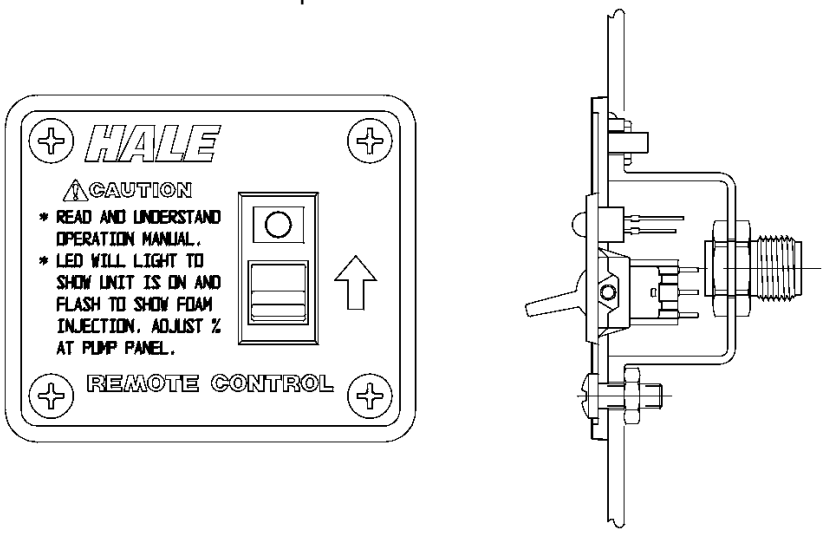


Close Fit Flanged Elbow
p/n: 098-0020-00-0
(115 flange inlet with 115 flange outlet)

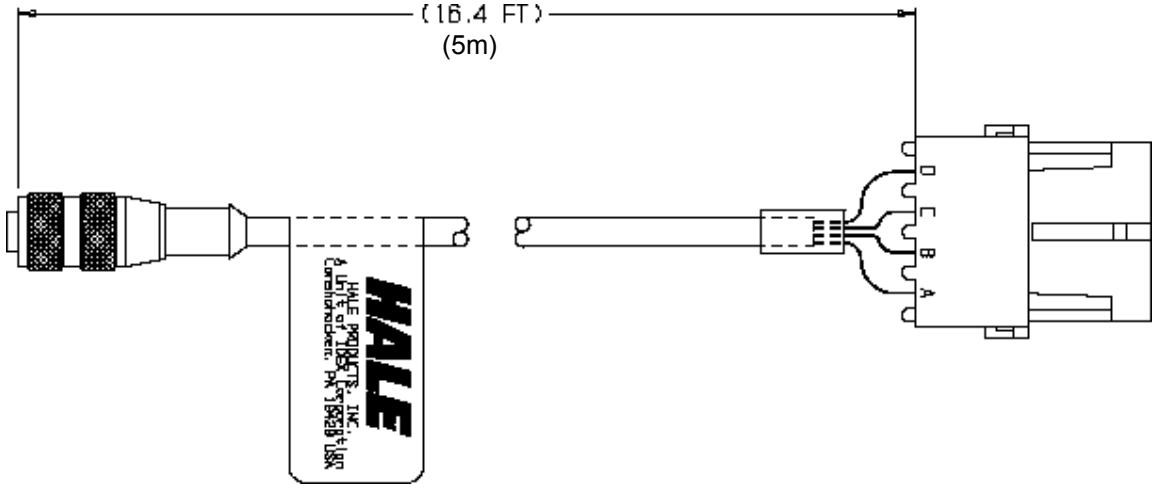


Mini-Manifold
p/n: 178-0320-02-0

Remote Start Option
Switch
p/n: 513-0330-01-0



Remote Start Option
Harness
p/n: 513-0680-00-0



NOTES

SECTION 3 INSTALLATION

To simplify installation selection, one of the two packages described in previous Section 2 should be ordered. While either package provides most of the components required for installation, the following guidelines are offered to assist the system installer with a complete system installation.

Carefully review the procedures that follow to ensure the system is properly designed. This section lists components that have been tested with Hale FoamLogix and provide the best system performance. Use of the recommended materials and specified parts ensures a virtually maintenance free installation.

Differences in apparatus plumbing and foam system configuration make it impractical to show exactly how the Hale FoamLogix 2.1A and 1.7AHP systems are installed on a particular apparatus. The information contained in this section, however, applies to most situations and should be used when designing and installing Hale FoamLogix 2.1A and 1.7AHP systems. A system plumbing and electrical diagram is provided at the end of this section to assist with installation.

Before proceeding with system installation, carefully review the procedures that follow to ensure the system is properly designed.

The Hale FoamLogix system is supplied with five major components that must be located on the apparatus.

- ❑ Foam pump and motor assembly
- ❑ Control unit
- ❑ Instruction/system diagram placard
- ❑ Flow Sensor
- ❑ Check valve injector fitting

Notes: The flow sensor and check valve injector fitting may be pre-mounted, if a manifold or pre-configured package is ordered.

Optional components that require mounting on the apparatus include:

- ❑ Mini Manifold
- ❑ Flanged elbows

IMPORTANT !

WHEN DETERMINING THE LOCATIONS OF HALE FOAMLOGIX COMPONENTS BEING INSTALLED KEEP IN MIND PIPING RUNS, CABLE ROUTING AND OTHER INTERFERENCES THAT COULD HINDER OR INTERFERE WITH PROPER SYSTEM PERFORMANCE.

FOAM PUMP AND MOTOR ASSEMBLY

The foam pump and motor assembly must be located in an area that is protected from road debris and excessive heat buildup. The back of a compartment or a compartment shelf is often an ideal location. The foam system, bypass valve, strainer and shut-off valve are located on the foam pump and motor assembly and access to these components must be provided.

The foam pump and motor assembly must be mounted below the discharge of the foam tank to provide for gravity feed to the foam pump. The foam tank must be located where refilling can be easily accomplished with 5 gallon (19 liters) pails and other methods suitable to the end user. Most water tank manufacturers build the foam tank into the booster tank.

When specifying a foam tank, make sure provisions are made for:

- ❑ Installation of the low tank level sensor

- ❑ Foam suction connections
- ❑ Tank drainage
- ❑ Proper fill openings, per NFPA requirements.

In addition, a foam tank refill system may be required. See Hale EZFill system for installation requirements.

CONTROL UNIT AND INSTRUCTION/ SYSTEM DIAGRAM PLACARD

Determine a location on the operator panel of the apparatus for the control unit and instruction/ system diagram placard, if provided. These components must be located at the main pump operator position in close proximity to each other. Consideration must be given for routing the control cable from the control unit to the distribution box on the foam pump and motor assembly. If necessary, order longer or shorter cable assemblies to suit the location demands.

INSTALLER SUPPLIED COMPONENTS

Due to the many differences in apparatus configurations and design requirements the Hale FoamLogix system installer must supply components, such as,

- ❑ mounting brackets
- ❑ piping
- ❑ hoses
- ❑ fittings
- ❑ electrical wiring
- ❑ foam tank(s)

The following guidelines are recommendations for selection of additional components for a complete system installation. These recommendations reflect materials and components that are tested extensively with Hale FoamLogix systems and provide proven reliable performance.

Foam Concentrate Suction Hose

The Hale FoamLogix 2.1A and 1.7 AHP Foam systems are provided with 15’ (4.6 meters) of 1/2” (13mm) ID reinforced PVC foam concentrate suction hose. The system installer may need to supply additional fittings and hose from the foam tank to the inlet of the foam pump.

All components selected transfer foam concentrate, therefore they must be compatible with the foam concentrates being used in the system. Hoses for Class A foam concentrates have minimum 1/2” (13mm) inside diameter.

Hoses for the foam concentrate suction must have a rating of 23” (584 mm) Hg vacuum and 50 PSI (3.5 BAR) pressure or greater.

Note: NFPA requires that foam concentrate suction hose be clear to observe foam concentrate flow during foam pump operation.

Recommended Components

- ❑ **Hose:** PVC, Kuriyama Kuri-Tec K3130 or K7130 series
- ❑ **Fittings:** Hose Barb Type; Brass, Stainless Steel or Nylon

A tee with foam tank shut-off valve and a drain valve is recommended in the foam tank suction hose to allow, tank drainage and easier priming.

These components are subject to the same material characteristics and pressure ratings as stated above.

The foam concentrate strainer includes a shut-off valve. This valve is used to shut off foam concentrate flow to service the strainer.

Foam Concentrate Discharge Hose

The system installer must supply fittings and hoses from the foam pump inject connection to the check valve/injector fitting inlet. All components selected transfer foam concentrate, therefore they must be compatible with the foam concentrates being used in the system.

The foam pump discharge connection is a 1/2” (13 mm) compression fitting. The check valve injector fitting connection has 1/2” NPT threads. Hoses and fittings of 1/2” minimum diameter rated at 500 PSI (34.5 BAR) working pressure or maximum discharge pressure of the fire pump must be used. Fittings and hoses must be compatible with all foam agents to be used.

Recommended Components

❑ **Hose:** Aeroquip 2580-8 or Equivalent Reinforced Hydraulic Hose.
❑ **Fittings:** Brass or Stainless Steel Hose End Crimp or Reusable Type (Aeroquip 412-9-8 or Equivalent)

Foam Concentrate Bypass Hose

The foam concentrate bypass hose connection is a 1/2” (13mm) hose barb connection. Hoses and fittings of nominal 1/2” diameter must be used as bypass hose. Since the bypass hose is used for calibration and draining the system it does not see high operating pressures; therefore, a hose with a lower pressure rating than the inject hose may be used.

Fittings and hoses used must be compatible with all foam agents expected to be used. Use fittings made of brass or 300 series stainless steel compatible with all foam concentrates.

Recommended Components

❑ **Hose:** Low Pressure Hydraulic Hose or Air Brake Tubing
❑ **Fittings:** Brass or Stainless Steel

It is recommended that the foam concentrate bypass hose be long enough to extend past the apparatus running board to reach five (5) gallon (19 liter) containers, making foam pump setup and calibration simpler.

Check Valves

Check valves must be installed on the apparatus with foam systems to prevent contamination of the foam concentrate with water and contamination of the fresh water tank with foam. (See Figure 3: “Typical Hale Foam-Logix 2.1A and 1.7AHP System Layout” on page 21.)

When a Hale FoamLogix 2.1A and 1.7AHP foam injection systems and related components are properly installed the required check valves are integral parts of the system.

NFPA standards require a check valve in the foam concentrate injection line at the injection point. The Hale p/n: 038-1790-00-0 Integral Check Valve/ Injector Fitting, a standard component included with the Hale FoamLogix 2.1A and 1.7AHP systems and installed when a manifold kit is ordered, meets these requirements and threads directly into the foam injection port on Hale manifolds.

Check valves must be installed in all water piping locations where foam concentrate could drain back into pumps or other components of the fire apparatus.

As a minimum one check valve must be installed where the water piping that supplies foam solution connects to the fire pump discharge. To more effectively keep foam contamination out of the fire pump and water tank, double check valves are recommended.

Separate two check valves by at least 6” to 8” (152 to 203mm) of piping to form a dead zone between the check valves. Individual drain lines should be used on each check valve. The waterway check valves must be rated for 500 PSIG (34.5 BAR) test pressure.

Flushing Water Hose

If a Hale and USFS approved Class “A” foam concentrate is used, flushing of the Hale FoamLogix 2.1A and 1.7AHP systems is not necessary as long as the system is used periodically.

If a flushing water hose is required to flush the foam pump, it must have a pressure reducer/ regulator that limits the flush water pressure to 25 to 50 PSI (2 to 4 BAR). The tubing and fittings used must be compatible with foam concentrates being used in the system.

To be NFPA compliant, when flushing is required, the system installer must provide proper

- ❑ hoses
- ❑ shut-off valves
- ❑ check valves
- ❑ reducer/regulator
- ❑ connections for flushing water for the system.

Foam Discharge Drains

Drains must be provided from foam capable discharge piping components to prevent freezing in cold weather. When designing the drain system care must be taken to prevent contamination of the water system with foam and the foam concentrate with water. Some multiple drain systems that allow individual drain lines to communicate also allow foam to bypass the installed check valves causing contamination of fire pump and the water or foam concentrate storage tanks.

Hale offers an optional manual or air-operated 6-port drain valve, Class1 Model MMD6 (p/n: 104961). The valve provides individual drains with a single control and is use for applications where a single point for multiple drains is required. If a Hale MMD6 drain valve is not used, individual drain lines and valves for foam capable discharge piping is recommended.

Apparatus design/build for cold weather (below freezing) duty

If the end-user will use the fire apparatus in sub-freezing temperatures, the onus is on the fire truck builder to build into the apparatus design an appropriate ambient temperature operating environment for the envelope where the FoamLogix system will be located. This routinely takes on the form and function of mounting the FoamLogix system in a limited ventilation area that is served by an appropriate pump house auxiliary heater. Simply, the fire truck builder must keep ambient air temperature above 32°F (0 deg C) in the envelope around the FoamLogix hardware, including the base foam pump unit, foam strainer, foam concentrate injection line, etc. There are several best practices in the fire industry that can be employed to meet this criteria and the fire truck builder/designer can choose the best choice for their specific installation. Note that there must be ventilation available to cool the area around the unit also, to prevent electric motor overheating when the unit is operating in high temperature ambient environments.

Electrical Requirements

The system installer must provide the primary power wire and a ground strap for the Hale FoamLogix system.

Primary power must be supplied from the main apparatus battery to the motor controller box on the foam pump and motor assembly. The Hale FoamLogix 2.1A and 1.7AHP require minimum 40 AMP electrical service.

Primary electrical power must be supplied directly from the battery or the battery master disconnect switch or solenoids to the Hale FoamLogix.

IMPORTANT!

OTHER ELECTRICAL COMPONENTS MUST NOT BE SUPPLIED FROM THIS WIRE. DO NOT CONNECT THE PRIMER AND HALE FOAMLOGIX TO THE SAME POWER WIRE.

The primary power connection must be made so

that power is supplied to the Hale Foam-Logix when the main apparatus electrical system is energized and the pump is in gear. Use of a solenoid with a 150 AMP peak, 85 AMP continuous rating is recommended. Figure 5: “Recommended Relay Wiring Schematic” shows the recommended wiring for this relay.

Note: This ensures immediate operation when the operator places the apparatus in PUMP mode, and to prevent battery power drain when the apparatus is not running.

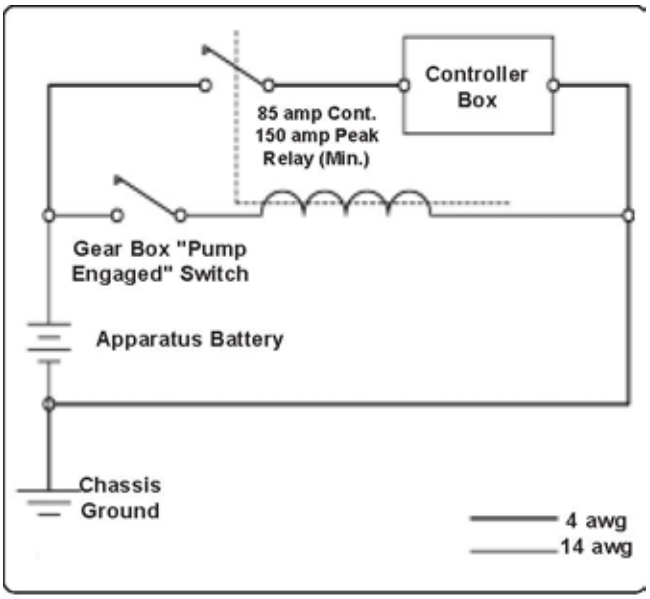


Figure 5: Recommended Relay Wiring Schematic

With Hale FoamLogix 2.1A and 1.7AHP cable lengths up to 6’ (1.8 meters) require a minimum 8 AWG type SGX (SAE J1127) battery cable. (See Table 6: “Recommended Primary Power Cable Sizes.”) Use solder lugs on cable ends with a 5/16” (8mm) diameter hole.

Models 3.3 and 5.0	Maximum length
8 AWG (8.4mm^2)	6’ (1.8M) or less
4 AWG (21.2mm^2)	6; (1.8M) to 15” (4.6M)
0 AWG (53.5mm^2)	15’ (4.6M) or Longer

Table 6: Recommended Primary Power Cable Sizes

When planning cable runs make sure the primary wires are routed by the shortest most direct route.

A braided flat ground strap connected to the apparatus chassis is recommended for the ground connection.

This limits the RFI/EMI interference encountered with radios, computers or other sensitive electronic equipment. The ground strap should be a minimum of 1-1/4” (32mm) wide and no longer than 18” (457mm). It must have soldered flat lug ends with 3/8” (10mm) diameter holes. If the ground strap length exceeds 18” (457mm), a wider ground strap should be used or use a double thickness of 1-1/4” (32mm) wide ground strap. The ground strap must be connected to the chassis. Use minimum 5/16” (8 mm) diameter bolt or mounting to secure the strap.

Power and ground must also be provided for the display unit using the 2 pin Packard connector. The power must be a minimum 5 amp dedicated and fused circuit. The ground must be connected to the chassis ground stud and protected from corrosion. Make sure the ground is attached directly to the chassis frame and not to the apparatus body work.

IMPORTANT!

BEFORE MAKING GROUND CONNECTIONS REMOVE ALL PAINT, GREASE AND COATINGS FROM THE CONNECTION AREA. AFTER MAKING CONNECTION, SEAL AGAINST CORROSION. WHEN A FLAT GROUND STRAP IS NOT AVAILABLE USE A BATTERY CABLE ONE SIZE LARGER THAN THE POWER CABLE USED.

FOAM CONCENTRATE TANK

A foam concentrate tank must be supplied to suit the capacity required for the apparatus application. The tank must meet NFPA minimum standards for its design capacity, including:

- ❑ Filler size
- ❑ Vapor pressure venting
- ❑ Baffling
- ❑ Drain facilities.

Foam Pump Mounting

Position the foam pump and motor assembly in the desired location on the apparatus. When installing the foam pump and motor assembly, the assembly should be kept in a HORIZONTAL position with the base plate on the bottom (See Figure 7: “FoamLogix Pump Installation.”)

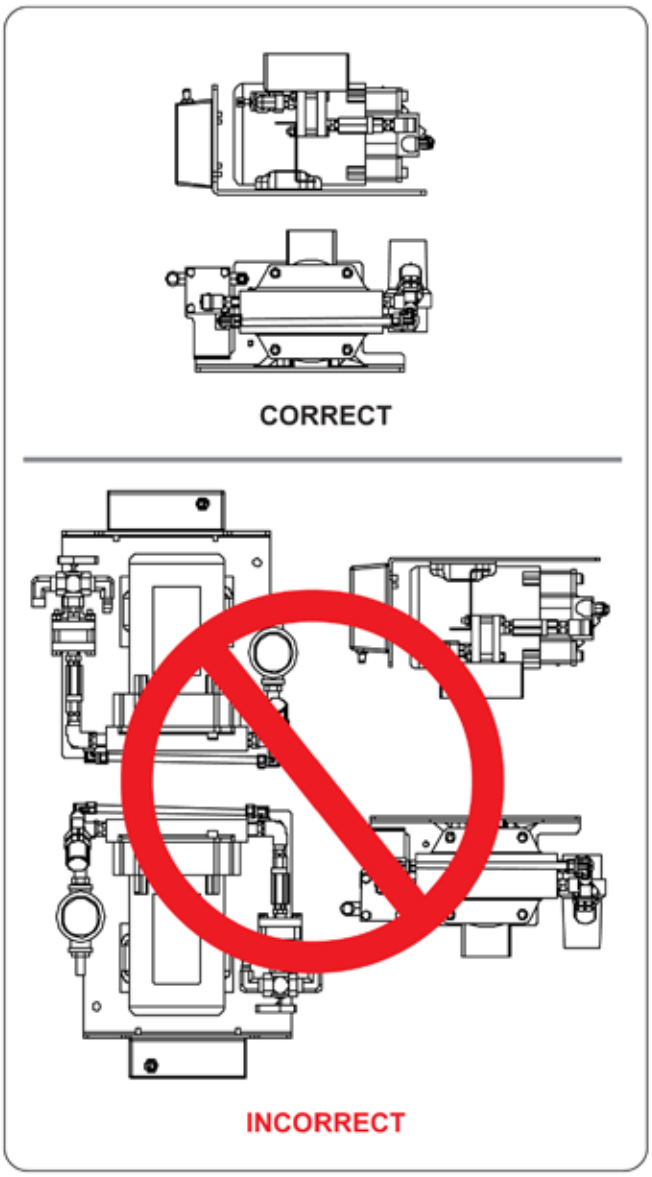


Figure 7: FoamLogix Pump Installation

Although the system is sealed and designed to be resistant to the harsh environment of fire fighting apparatus, a compartment with easy operator access is recommended.

The base plate of the foam pump and motor assembly must be anchored to a surface or structure that is rigid and of adequate strength to withstand the vibration and stresses of apparatus operation.

Figure 8: “Base Plate Mounting Hole Locations,” on page 35, provides the mounting base dimensions for the FoamLogix foam pump and motor assembly.

Make sure the foam concentrate hoses are properly routed to the inlet and outlet on the foam pump. Foam concentrate must gravity feed to the foam pump inlet from the foam tank(s). The foam pump must be mounted in an area to avoid excessive engine exhaust system heat or accessory heat buildup.

The base of the foam pump and motor assembly includes 5/16” (8mm) diameter predrilled mounting holes. The apparatus mounting location must to be drilled accordingly. The base plate may be used as a template to mark mounting hole location. Also see Figure 8: “Base Plate Mounting Hole Locations” on page 35.

PLUMBING INSTALLATION

Hale FoamLogix System plumbing diagram is located on page 21 of this manual.

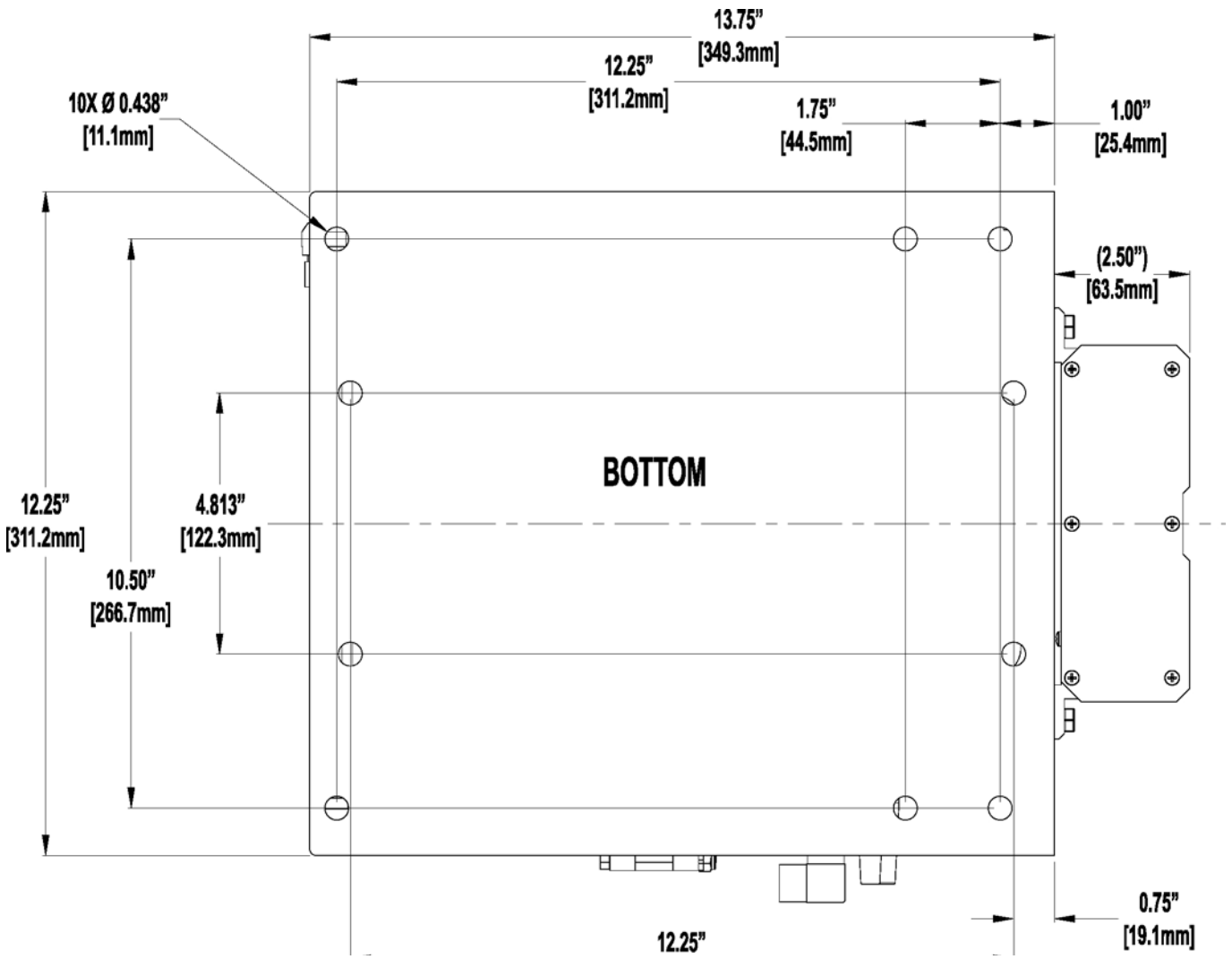


Figure 8: Base Plate Mounting Hole Locations

The diagram provides recommended guidelines for the installation of system components that handle water, foam concentrate and foam solution. The sequence in which the plumbing installation is completed depends on your individual installation.

Water and Foam Solution Plumbing

When installing water and foam solution piping runs, use best industry practices to install this piping. Use a suitable pipe sealing compound at all joints.

Check Valve Manifold

Hale pre-made stainless steel foam manifolds are recommended.

The manifolds are available in kits and eliminate the extra labor and leaks from large pipe thread connections.

The manifolds use 3" (76mm) Victaulic connections and are available in single or dual check valve configurations.

Figure 9: "Check Valve Manifold Installation," on page 36, shows a typical check valve manifold installation.

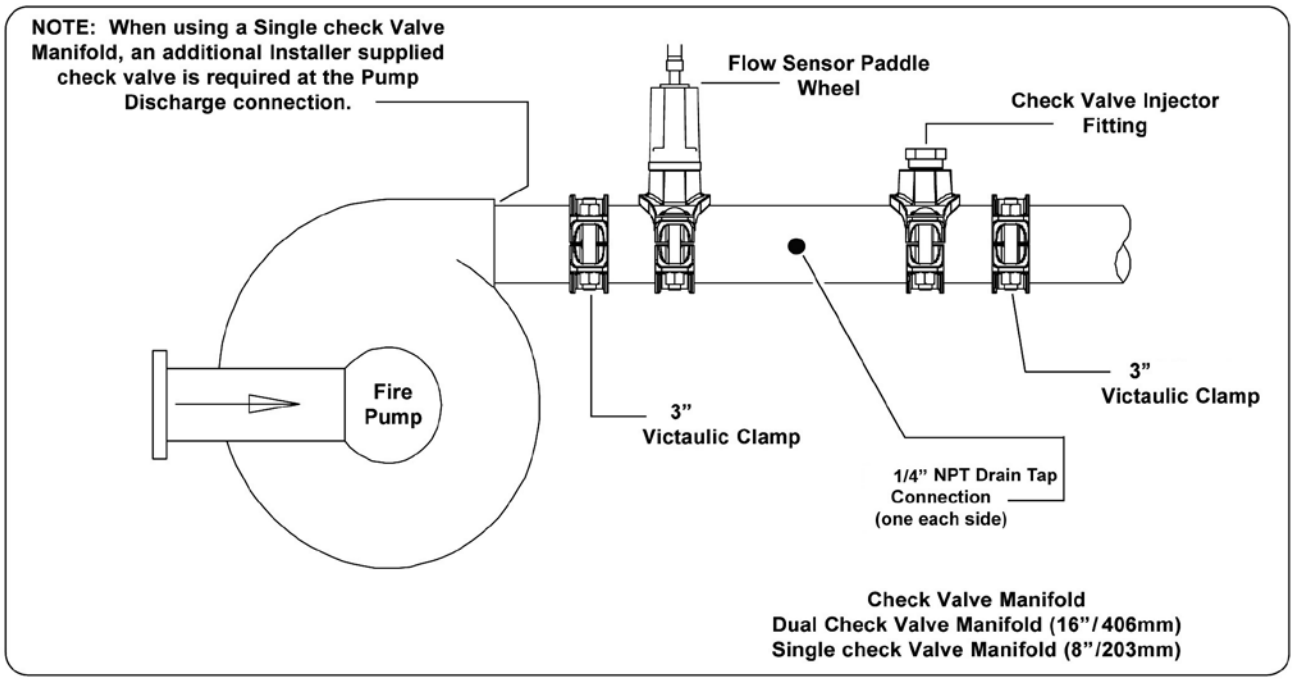


Figure 9: Check Valve Manifold Installation

Note: When the manifold is installed the drain tap that must be placed in the "down" position and plumbed to an individual drain.

When properly mounted, the flow sensor and check valve/injector fitting are on the side of the manifold and one of the drain ports is on the bottom. The flow sensor should point upwards slightly to allow drainage of water and sediment. See Figure 12: "Flow Sensor Tee Position Range," on page 38.

Optional Hale Piping Components

Hale piping components, such as 3" (76mm) and 4" (102mm) wafer-type check valves, 115 and 2433 series flanges, mini manifold, etc. are available to simplify installation of water and foam solution discharge piping.

The arrangement shown in Figure 10: "Typical Midship Pump Installation," on page 37, provides accurate proportioning across a wide range for up to four discharges from the mini manifold.

The Hale mini manifold provides a 1" NPT tap for installation of the check valve/injector fitting.

The Hale mini manifold and elbow components offer 4-3/8" diameter bolt circles and minimize fabrication and pipe work. After installation, make sure all pipes, hoses and tubes are supported using the best industry practices.

Figure 11: "Typical 4" Check Valve Installation, Midship Pump" on page 37 shows a suggested installation arrangement using Hale 4" (102mm) check valves, pipe and Hale 2433 flanges.

"Waterway" Check Valves

Check valves in the waterway, rated at 500 PSI (34.5 BAR), are required to keep foam solution out of the main pump and allow pump priming without drawing foam into the piping.

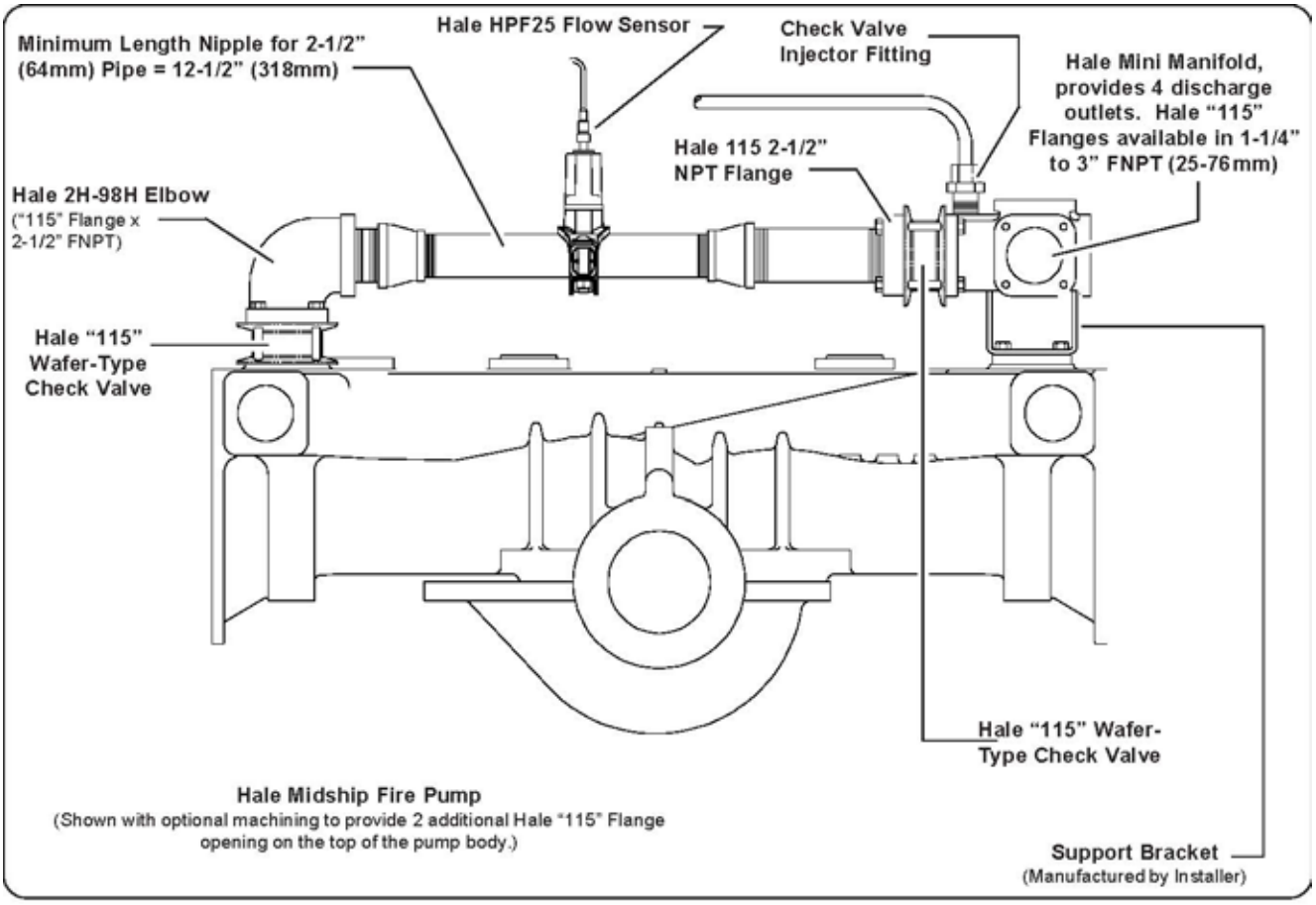


Figure 10: Typical Midship Pump Installation

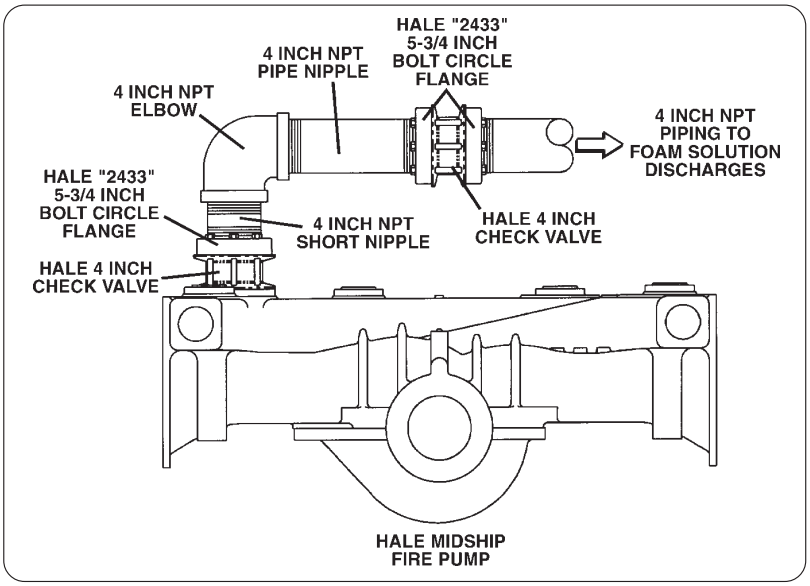


Figure 11: "Typical 4" Check Valve Installation, Midship Pump

Using double check valves, separated by at least 6” to 8” (152 to 203mm) of pipe before the foam injection point, ensures that the pump and tank water remain uncontaminated.

Flow Sensor

The Hale FoamLogix flow sensor is specially designed to enable quick and easy sensor inspection and maintenance. The flow sensor paddle wheel is installed on a saddle clamp or weld fitting to the foam-capable discharge piping of the apparatus.

In horizontal piping runs, the flow sensor is mounted within the range shown in Figure 12: “Flow Sensor Tee Position Range.”

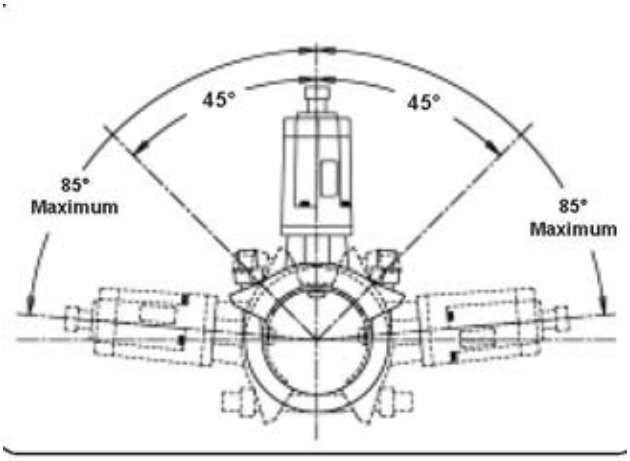


Figure 12: Flow Sensor Tee Position Range

When selecting a flow sensor, it is important to consider the minimum and maximum flow requirements during operation. Refer to the Figure 4: “Pipe Size vs. Flow Rate,” on page 24, for the proper pipe size for flow range desired.

The flow sensor is installed in the piping before the foam concentrate injection point.

This is true in applications where the foam system needs to supply a 3” (76mm) deck gun, as well as a 1” (25.4mm) booster line.

Pipe Size	Minimun Recommended Straight Run Pipe
1-1/2”	9”
2”	12”
2-1/2”	15”
3”	18”
4”	24”

Table 13: Pipe Size vz. Minimum Straight Run

Pipe size for flow sensor mounting must be selected to provide accuracy at the lowest flow rate. Mounting the flow sensor in a short section of pipe, one pipe size smaller (e.g., 4” to 3”; 3” to 2-1/2”, etc.), provides better accuracy at the lower flows.

Refer to the Table 13: “Pipe Size vs. Minimum Straight Run” for pipe size. Selecting the next smaller pipe permits reducing the straight pipe run the required distance prior to the flow sensor paddle wheel.

In the short length of reduced pipe pressure loss is minimal and there is minimal pressure loss through elbows and fittings. See Figure 14: “Typical Reduced Size Sensor Piping Arrangement” on page 39.

Excessive turbulence in the flow sensor may produce unstable and inaccurate flow readings. The length of straight pipe prior to the flow sensor must be sufficient to reduce any turbulence in the pipe.

The following guidelines help attain the best readings, and maintain Hale FoamLogix system accuracy.

1. A minimum of **6 times the pipe diameter** of straight run pipe without any fittings is necessary prior to the flow sensor paddle wheel. (See Figure 15: “Flow Sensor Placement” on page 39.)

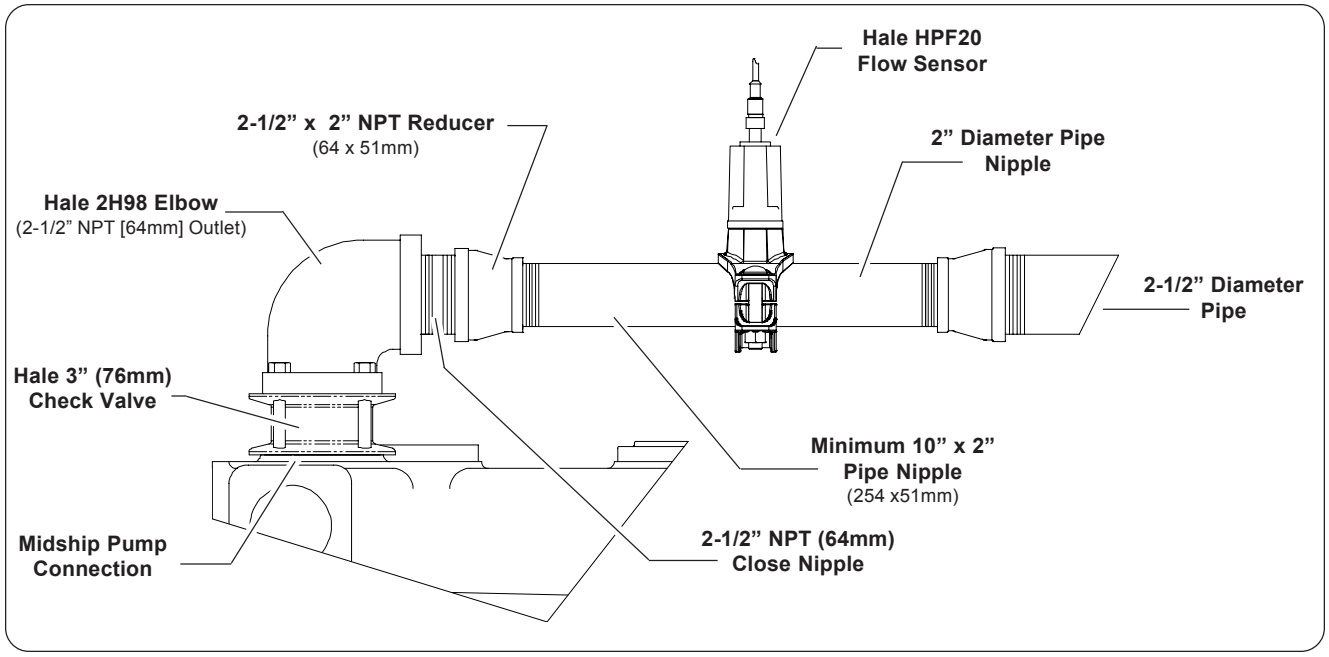


Figure 14: Typical Reduced Size Sensor Piping Arrangement

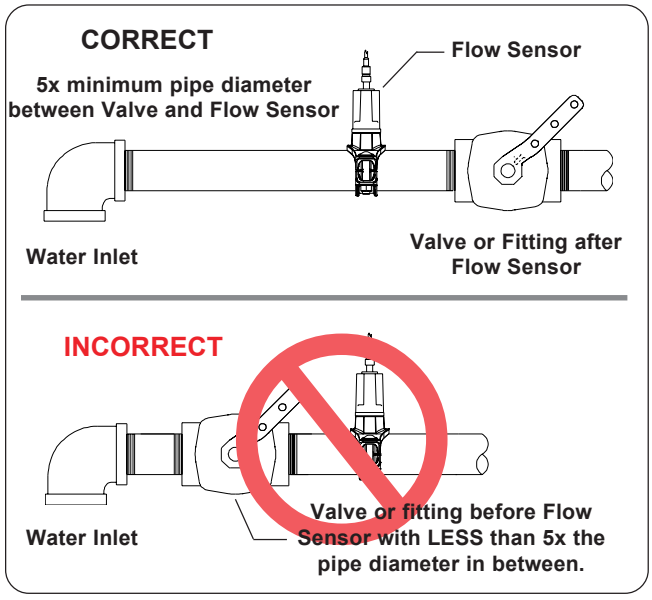


Figure 15: Flow Sensor Placement

2. The downstream piping length is not as critical, but there must be a short length of straight pipe with no fittings or valves immediately after the flow sensor paddle wheel. Two to three times the pipe diameter is recommended.

3. **Do not mount a flow sensor directly after an elbow or valve. Valves create severe turbulence when they are "Gated".**

Saddle Clamp Installation

See Figure 16: Flow Sensor/Saddle Clamp Installation" on page 40.

Installation of the Paddle Wheel Flow Sensor using a saddle clamp requires a 1.385"/ 1.390" (35/35.3mm) bored hole in the pipe.

A minimum of six times the pipe diameter of straight run pipe without any fittings is necessary prior to the position of this hole.

The flow sensor requires a spacer and eight stainless steel internal hex head screws. These are supplied with the sensor.

Four 6-32 x 1/2" screws attach the spacer to the saddle clamp mount, and four 6-32 x 3/4" screws with lock washers attach the paddle wheel to the spacer.

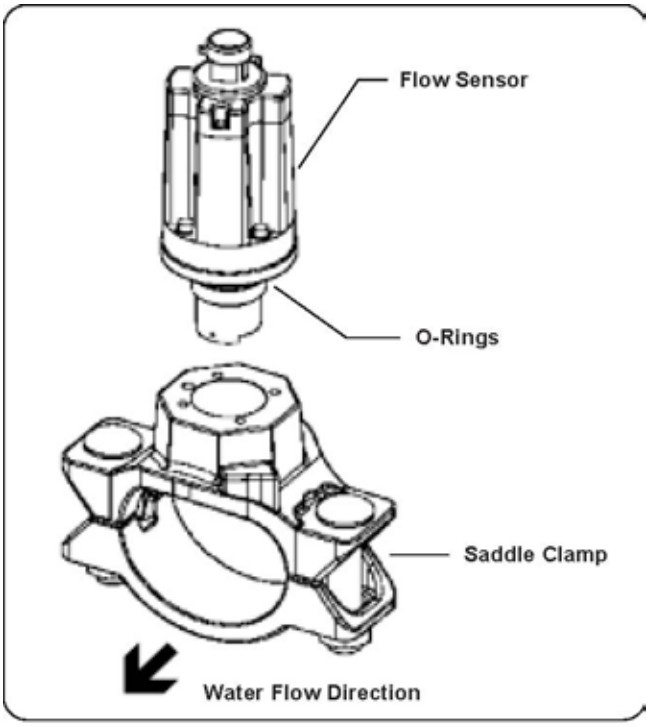


Figure 16: Flow Sensor/Saddle Clamp Installation

Align the indexing pin of the saddle clamp to the indexing hole of the spacer to align the saddle clamp mount.

Secure with four 1/2” machine screws, no lock washers. Torque to 8.5 in.-lbs. (1.0 N-m).

Align the paddle wheel indexing pin to the indexing hole in the spacer and secure using four 3/4” screws and lock washers. Torque to 7.5 in.-lbs. (0.9 N-m).

Apply a small amount of grease to the saddle clamp gasket before the final installation of the assembly onto the pipe. Firmly tighten the saddle clamp onto the pipe.

Foam Pump Flush System

The flushing water hose must be a minimum of 1/2” (12 mm) inside diameter. The flush water supply is provided from one of the pressure taps on the discharge side of the fire pump.

It must be reduced to 50 PSI (3.5 BAR). It is recommended to installed a check valve at the pressure tap to prevent contamination.

FOAM CONCENTRATE PLUMBING

CAUTION!

MAKE SURE THE FOAM TANK AND FOAM CONCENTRATE SUCTION HOSES ARE CLEAN BEFORE MAKING FINAL CONNECTION TO FOAM PUMP.

FLUSH TANK AND HOSES PRIOR TO MAKING CONNECTIONS.

MAKE SURE THE FOAM CONCENTRATE IS GRAVITY FED FROM THE TANK TO THE PUMP.

Foam concentrate plumbing consists of:

- ❑ Foam concentrate suction hose
- ❑ Foam strainer
- ❑ Foam concentrate discharge hose
- ❑ Check valve/injector fitting.

Foam Strainer Connection

CAUTION!

THE FOAM CONCENTRATE STRAINER ASSEMBLY, MOUNTED ON THE FOAM PUMP INLET, IS A LOW PRESSURE DEVICE. IT WILL NOT WITHSTAND FLUSHING WATER PRESSURE. IF FLUSHING WATER IS TO BE PROVIDED THE PRESSURE MUST BE LIMITED TO 50 PSI (3.5 BAR).

The strainer/valve assembly has 1/2” (12mm) NPT female threaded ports. A 1/2” hose barb fitting is supplied to connect the 1/2” ID hose, provided with the Hale Foam-Logix 2.1A installation kit.

The hose from the foam tank to the strainer must have adequate wall stiffness to withstand the vacuum of the foam pump while it is operating (23" [584 mm] Hg and 50 PSI [3 BAR], Kuriyama, Kuritec K-3130 or K-7130 series or equal).

After the foam pump is mounted on the apparatus, connect the PVC hose provided to the strainer inlet.

Install the clear plastic hose from the foam tank outlet to the inlet of the strainer/valve assembly. The inlet is on the valve end. Wetting the ends of the hose and fittings makes the installation on the hose fittings easier.

CAUTION!

MAKE SURE THE FOAM TANK AND FOAM CONCENTRATE SUCTION HOSES ARE CLEAN BEFORE MAKING FINAL CONNECTION TO FOAM PUMP. IF NECESSARY FLUSH TANK AND HOSES PRIOR TO MAKING CONNECTION.

Check Valve/Injector Fitting

The Hale check valve/injector fitting, supplied with the Hale FoamLogix system, meets NFPA requirements for a non-return device in the foam injection system. It prevents back flow of water into the foam concentrate tank.

When properly installed the brass and stainless steel construction check valve/injector fitting ensures foam concentrate is injected into the center of the water flow for better mixing.

Note: Always position the check valve/ injector fitting at a horizontal or higher angle to allow water to drain away from the fitting. (See Figure 17: "Check Valve Injector Fitting Installation.") This avoids sediment deposits or the formation of an ice plug.

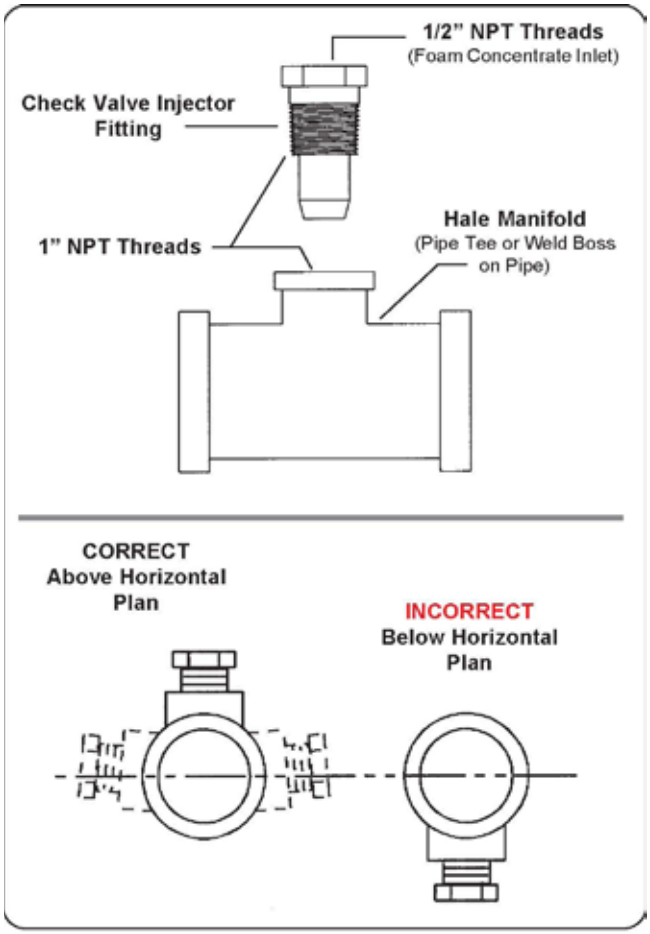


Figure 17: Check Valve Injector Fitting Installation

The check valve/injector fitting MUST be mounted in a location that is common to all discharges which require foam concentrate. (See Figure 18: "Injection and bypass Hose Connection")

The Hale FoamLogix system DOES NOT permit a separate injection point for each foam capable discharge.

The check valve/injector fitting has – 1" NPT (25.4mm) threads on the outside, to fit into the 1" NPT threaded connection on the Hale mini manifold a pipe tee, or a 1" NPT weld fitting installed in the discharge piping of the fire pump. (See Figure 17: "Check Valve Injector Fitting Installation.")

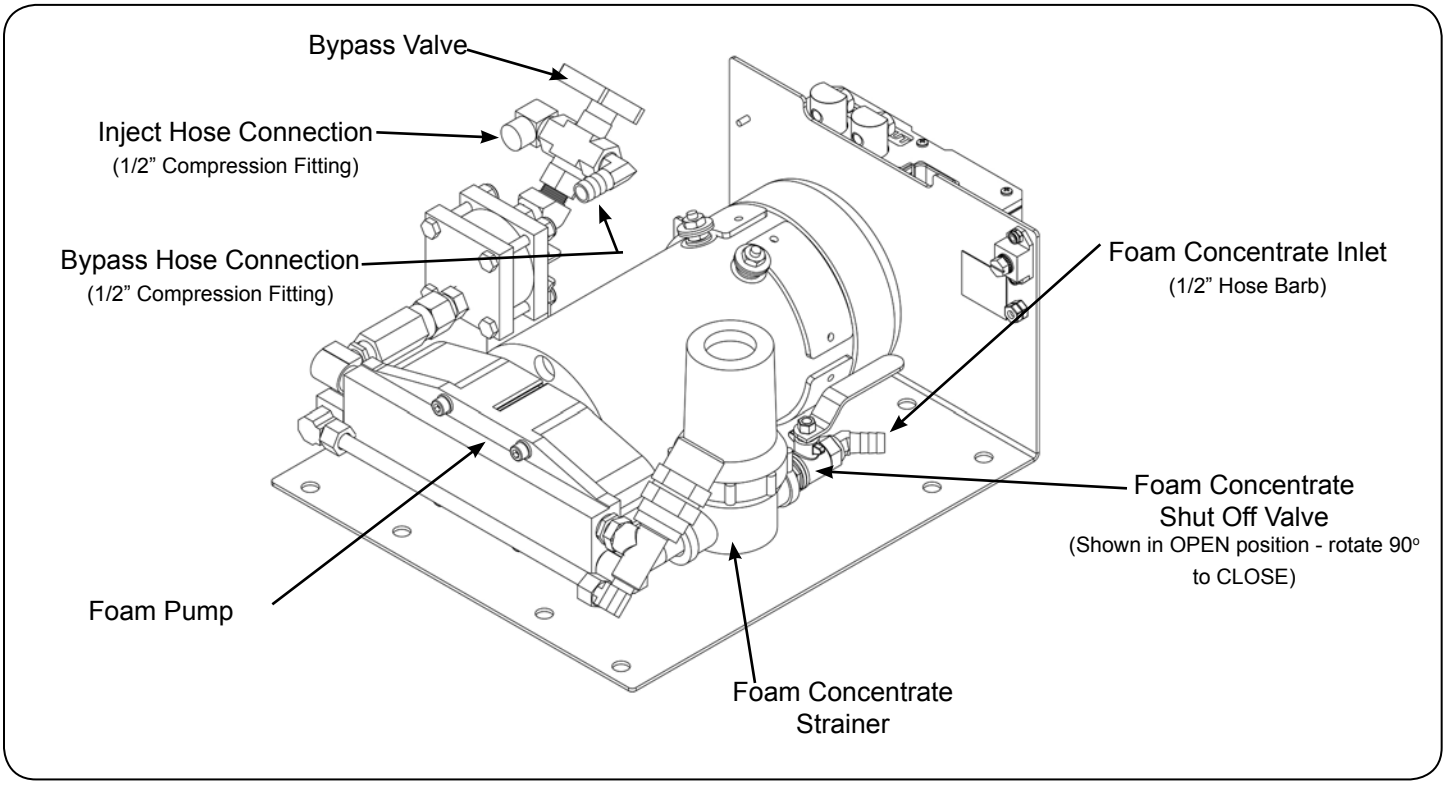


Figure 18: Injection and Bypass Hose Connection

The inlet connection of the check valve/ injector fitting uses a 1/2" NPT female thread.

Foam Concentrate Injection Hose

Connect a hose from the foam pump inject port to the inlet of the check valve injector fitting. (See Figure 18: "Injection and Bypass Hose Connection")

The hose and fittings from the INJECT port to the check valve injector fitting should have minimum 1/2" (13 mm) outside diameter and be rated at 500 PSI (34 BAR) working pressure (Aeroquip 2580-10 or equal).

Bypass Hose Connection

A bypass valve is mounted on the discharge of the foam pump. The bypass handle must be accessible by the pump operator during normal operations.

The bypass is a 3-way directional valve. Determine which port is the INJECT port and which port is the BYPASS. (See Figure 18: "Injection and Bypass Hose Connection")

Bypass hose connections are 1/2". Hose fittings compatible with all foam concentrates must be provided. The hose from the BYPASS port is plumbed to the atmosphere.

This hose is used for calibrating the foam pump, pumping the concentrate into a container to empty the foam tank or to assist in priming of the foam pump. The hose from the BYPASS port must be long enough to reach a container outside the truck.

ELECTRICAL INSTALLATION

Electrical Connections

Complete harness electrical diagrams are provided on page 45 of this manual. Refer to these diagrams for proper installation of each of the electrical components.

The Hale FoamLogix system is designed to be installed with a minimum of electrical connections. Cables are provided with each Hale FoamLogix system to make the flow sensor, control unit and motor controller box connections.

The system installer must supply primary power wire, low tank level sensor wire and flat braided ground straps.

CAUTION!

- ❑ Review the “Safety” section of this manual, beginning on page 11, in its entirety before proceeding with electrical connections.
- ❑ To prevent system damage or electrical shock the main power supply wire must be the last connection made to the Hale FoamLogix motor controller box. See Figure 3: “Typical Hale FoamLogix 2.1A and 1.7APH System Layout” on page 21.
- ❑ The cables provided with each Hale FoamLogix system contain shielded assemblies.

  NEVER attempt to shorten or lengthen the shielded cables. If necessary order longer or shorter cables from Hale Products to suit the particular installation.
- ❑ The cables are indexed so they connect to the correct receptacle one way only. When making cable connections DO NOT force mismatched connections as damage can result, causing improper system operation.
- ❑ The cables shipped with each Hale FoamLogix system are tested at the factory with that unit. Improper handling and forcing connections can damage these cables which could result in other system damage.
- ❑ The system can only perform when the electrical connections are sound. Make sure each electrical connection is correct.
- ❑ Hale FoamLogix systems are designed for use on direct current, negative (–) ground apparatus electrical systems only.
- ❑ Do not mount radio transmitter or transmitter cables in direct or close contact with the Hale FoamLogix unit.
- ❑ Before connecting the cables, inspect the O-ring seal in the female connector. If the seal washer is missing or damaged, water can enter the connector causing corrosion of the pins and terminals resulting in possible system failure.
- ❑ The ground strap must be a minimum of 1-1/4” (32mm) wide and no longer than 18” (457mm).

  A longer ground strap must be wider or a double thickness strap must be used. Make sure the ground strap is attached to the chassis frame. Grounding to the body IS NOT acceptable.
- ❑ Always disconnect the power cable, ground straps, electrical wires and cables from the control unit or other Hale FoamLogix equipment before electric arc welding at any point on the apparatus. Failure to do so could result in a power surge through the unit that could cause irreparable damage.
- ❑ There are no user serviceable parts inside Hale FoamLogix system electrical/ electronic components. Opening of these components (motor controller box or control unit) voids the warranty.

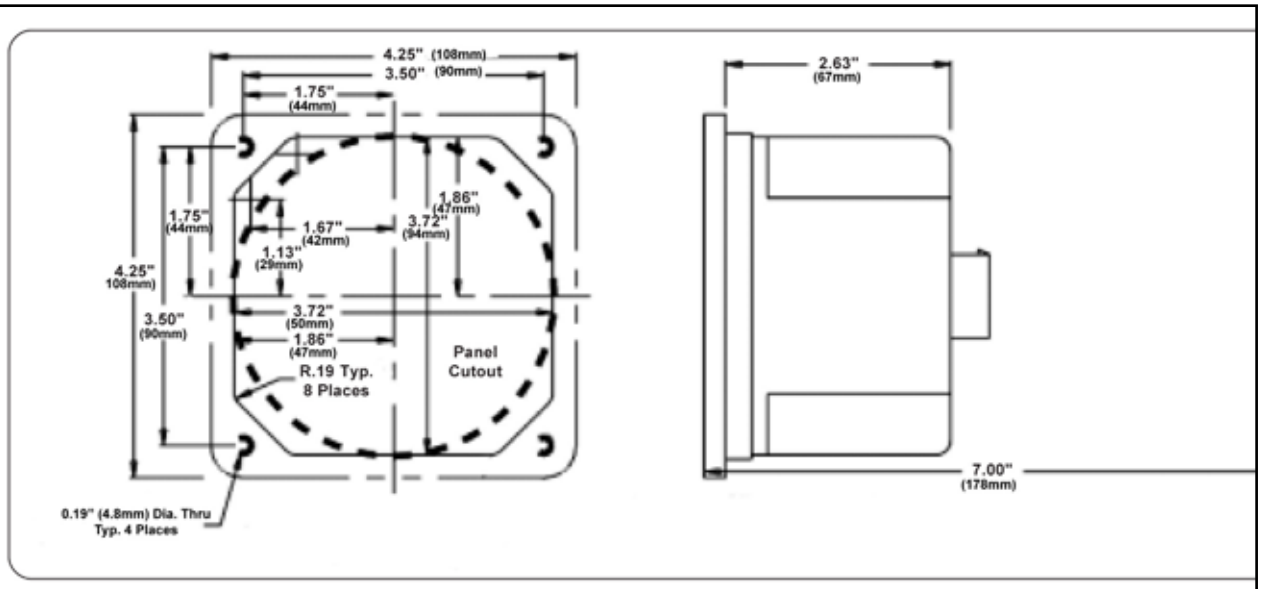


Figure 19: Control Unit Mounting Dimension

Control Unit

The control unit mounts in the operator panel of the apparatus. The display is secured with four #8 socket head screws. (See Figure 19 “Control Unit Mounting Dimension” for mounting dimensions).

The display requires a 7” (178mm) minimum clearance from the back of the operator panel to allow proper connection of cables. Once the control unit is mounted on the operator panel, attach the 14 pin AMP connector on the cable assembly to the back of the display. Referring to Figure 20: “Control Harness Connections” and Figure 21: “System Power and Ground Connections,” on page 45, make connections to the motor controller box and flow sensor.

Notes: Ensure that the panel where the control unit is mounted has an adequate ground. For stainless steel and vinyl coated panels a ground strap ½ inch (12mm) wide must be attached from one of the four screws holding the control unit in place to the frame of the fire truck to ensure adequate grounding.

Allow a service loop to prevent “pulling” of the wires or connectors during body and frame flex.

Display Unit Power and Ground Connections

Power must be connected directly to the display unit. The power and ground connection is the 2-pin packard connector on the 12”(305mm) long pigtail of the harness (see Figure 20 on page 45).

The mating harness provided is approximately 18” (457mm) long. If additional wire length is required, use minimum 16 AWG type SXL, or GXL (SAE J1128) wire.

Connect the black (B) wire to a chassis ground stud. Protect the ground connection from corrosion.

Connect the red (A) wire to the power supply. It is recommended to connect the power wire to a minimum 5 AMP, fused, dedicated circuit. If a dedicated circuit is not available, the power lead may be connected to a terminal where there is not a HIGH current load. Acceptable additional components powered from this terminal include ENFO IV, Governor, Tank Level Gauge, Etc.

Figure 20: Control Harness Connections
(Single Tank System Shown) (Connections required during system installation

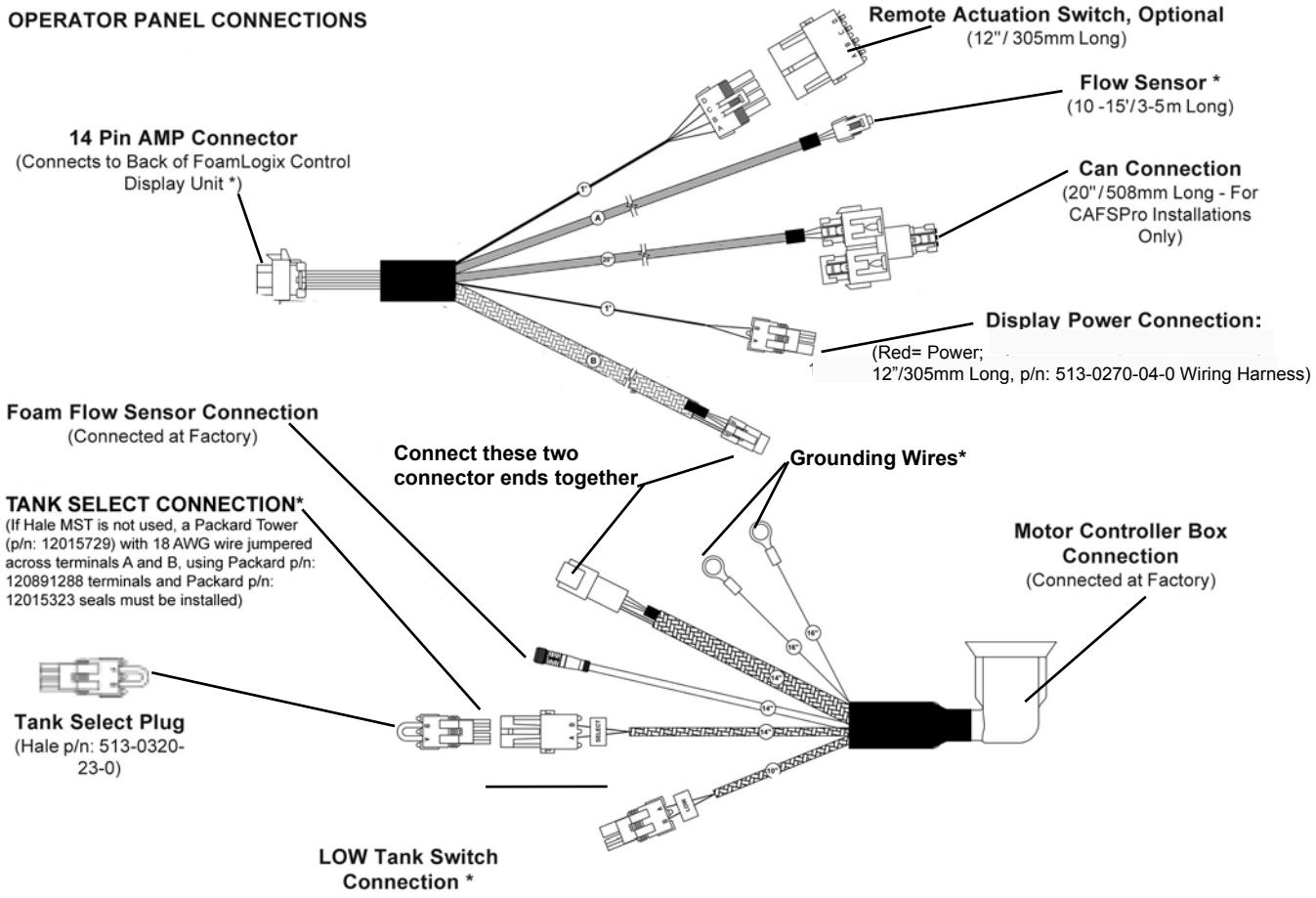
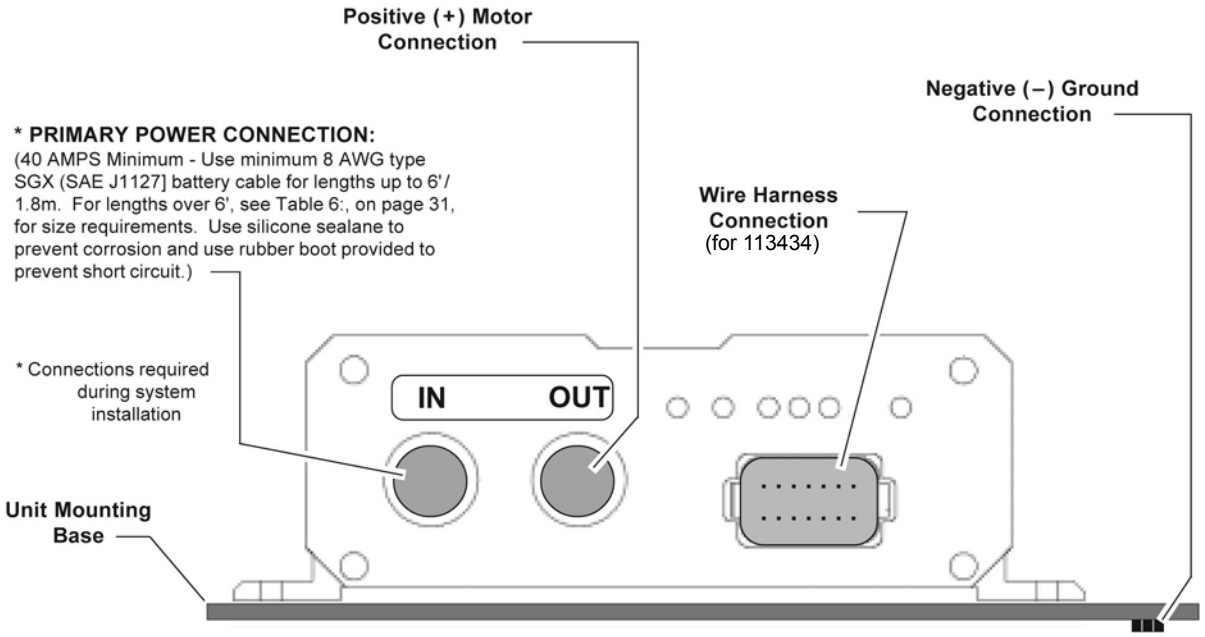


Figure 21: System Power and Ground Connections



Motor Ground / Primary Power

CAUTION!

CONNECT THE PRIMARY POSITIVE LEAD FROM THE TERMINAL BLOCK TO THE MASTER SWITCH TERMINAL OR RELAY TERMINAL USING MINIMUM 8 AWG TYPE SGX (SAE J1127), CHEMICAL RESISTANT, BATTERY CABLE AND PROTECT WITH WIRE LOOM.

PREVENT CORROSION OF POWER AND GROUND CONNECTIONS BY SEALING THESE CONNECTIONS WITH THE SILICONE SEALANT PROVIDED.

Ground Connection

Be sure the Hale FoamLogix system is grounded to the chassis. Use a short length of wide flat ground strap at least 1-1/4” (32 mm) wide and less than 18” (457 mm) long to reduce the potential of RFI emitted by this connection.

A stud is located on the mounting base to attach the chassis ground strap to the Hale FoamLogix system. (See Figure 21: “System Power and Ground Connections” on page 45.)

When making the ground strap connections make sure lugs are soldered to the strap ends for trouble free connections. Seal all connection against corrosion.

When the length of the ground strap exceeds 18” (457 mm) use a wider strap or a double thick strap.

CAUTION!

DO NOT CONNECT THE MAIN POWER LEAD TO SMALL LEADS THAT ARE SUPPLYING SOME OTHER DEVICE, SUCH AS A LIGHT BAR OR SIREN. THE HALE FOAMLOGIX MODELS 2.1A AND 1.7AHP REQUIRE 40 AMP MINIMUM CURRENT.

Primary Power Supply Connection

Make sure adequate switched electrical power from the battery + terminal to the battery connection stud on the motor controller box is provided. (See Table 6: “Recommended Primary Power Cable Sizes” on page 33.)

Use 8 AWG minimum type SGX (SAE J1127) battery cable directly to the battery, battery switch or solenoids for cable runs up to 6’ (1.8 meters) long. Longer wire runs may require larger battery cable for proper operation. DO NOT connect power to the same connection as the pump primer.

RFI/EMI

Electrically shielded cables for control unit and flow sensor are provided with the Hale FoamLogix system. The cables are 100% electrically shielded to eliminate the potential problem of EMI/RFI.

Proper installation of system components and cables along with proper grounding will limit radio interference caused by the Hale Foam-Logix system. Additionally, make sure radio cables and hardware are not located in the immediate area where Hale FoamLogix equipment is mounted.

Making round coils of extra control and flow sensor cables in the pump compartment can act as an antenna. While the control and flow sensor cables cannot be shortened, various lengths of cable are available to minimize the “extra” cable in the truck.

When routing control and flow sensor cables take care to avoid routing them next to antenna wires, radio power lines and radio components. When there is extra cable, double the cable back on itself and secure with plastic wire ties in a flat bundle instead of making a round coil. (See Figure 22: “Extra Cable Storage” on page 47.)

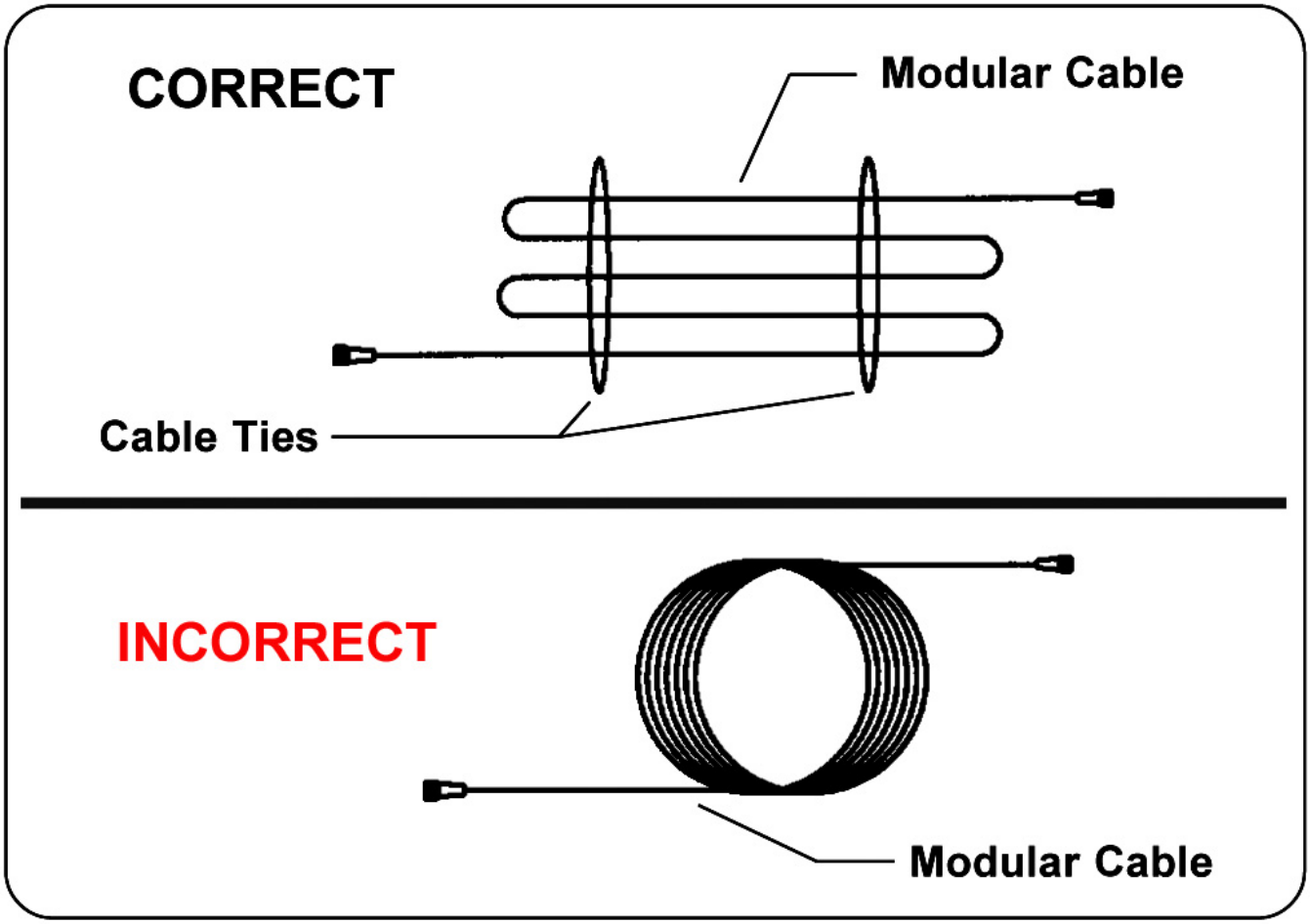


Figure 22: Extra Cable Storage

START-UP CHECKLIST

Before energizing the apparatus and Hale Foam-Logix system for the first time make sure the following items are checked:

ELECTRICAL

- ❑ Tank level sensor wires connected to distribution box and sealed from moisture.
- ❑ Tank level sensor functions properly.
- ❑ Control cable connection at distribution box correct and tight.
- ❑ Flow sensor cable properly connected.
- ❑ All cables and wires are secured and protected from damage during operation.
- ❑ Control and flow sensor cables properly folded and secured; radio antennas, power lines and equipment away from cables.
- ❑ Foam pump and motor assembly properly grounded using flat ground strap.
- ❑ Correct voltage provided. Direct current, negative (–) ground.
- ❑ Adequate current, 40 AMPS minimum, available. Main power direct to battery, battery switch or solenoid without primer or other accessories tied in.
- ❑ Primary electrical and ground connections tight and protected from corrosion with silicone sealant.
- ❑ Splices in wires sealed from moisture using adhesive filled heat shrink tubing.

LIQUID

- ❑ Flow sensor mounted with flow arrow in the correct direction for water flow.
- ❑ Check valves are properly mounted in water and foam concentrate lines.
- ❑ Strainer mounted for proper concentrate flow direction in foam tank to pump hose.
- ❑ Foam tank to foam pump valve is in place and open.
- ❑ Check valve/injector fitting lines are proper size and connections are tight.
- ❑ Bypass valve is properly mounted and oriented for direction of concentrate flow.
- ❑ Foam concentrate gravity feeds to foam pump from foam concentrate tank.
- ❑ All hoses free of kinks and sharp bends.
- ❑ No sharp bends that can trap air exist in system.
- ❑ Flush water connections correct and tight.
- ❑ Discharge piping hydro tested in accordance with NFPA/UL requirements.
- ❑ Bypass valve handle is in the INJECT position.

FOAM PUMP

- ❑ Foam pump and motor assembly mounted in horizontal position with base plate down.
- ❑ Foam pump and motor assembly properly secured using proper mounting hardware.
- ❑ Foam pump suction and discharge hoses connected to proper ports.
- ❑ Foam pump suction and discharge hose fittings tight.

System Installer Start-up

On initial power-up of the Hale FoamLogix system, at the installer facility, the following procedures must be followed.

INITIAL SYSTEM POWER CHECK

Watch the display on the control unit as the apparatus electrical system is turned ON. Check the control unit readout for:

- ❑ FLOW
- ❑ TOTAL FLOW
- ❑ % FOAM
- ❑ TOTAL FOAM
- ❑ all bar graph LEDs light
- ❑ “88888” appears for several seconds
- ❑ “HALE CLASS 1 2002” (or “HALE CLASS 1 [CURRENT DATE]”) scrolls across the display
- ❑ The default display, zero (0), if no water is flowing and FLOW LED

(See Figure 23: “Control Unit Ready Indication”)

If a default display does not appear, refer to Section 6: TROUBLESHOOTING for possible **WARM-UP/ SYSTEM CHECKING** causes and solutions.

INITIAL SYSTEM CHECK

After initial system power-up, low tank level sensor operation, foam pump operation and flow sensor calibration must be checked per the following:

CAUTION !

WATER IS USED AT THE SYSTEM INSTALLER FACILITY TO VERIFY LOW TANK LEVEL SENSOR SYSTEM READY OPERATION AND FOAM PUMP PERATION AS THE END USER SPECIFIED FOAM CONCENTRATES MAY NOT BE READILY AVAILABLE.

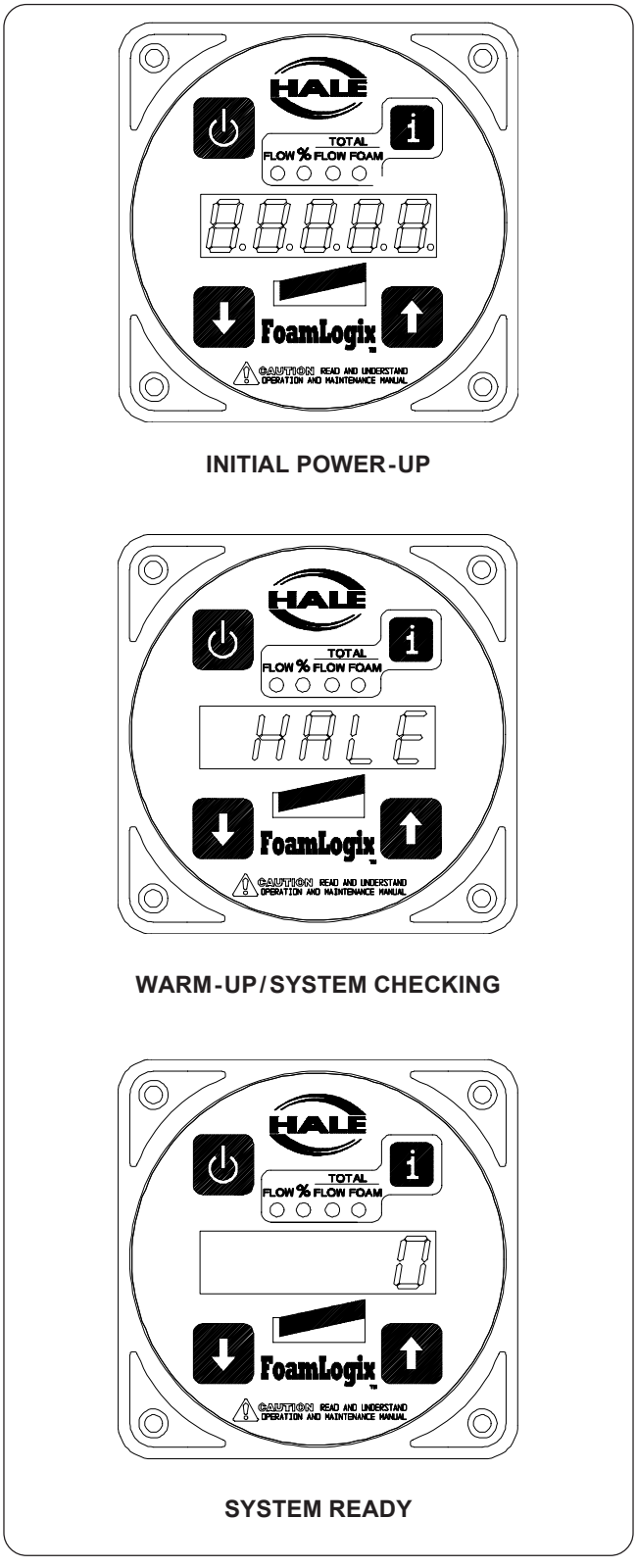


Figure 23: Control Unit Ready Indication

DO NOT PUMP WATER WITH THE HALE FOAM-LOGIX FOAM PUMP FOR MORE THAN ONE (1) MINUTE. DO NOT ATTEMPT TO CALIBRATE FOAM PUMP FEEDBACK SENSOR WITH OTHER THAN END USER SPECIFIED FOAM CONCENTRATE.

MAKE SURE THE BYPASS VALVE IS IN THE BYPASS POSITION WHEN PUMPING WATER WITH THE FOAM PUMP.

1. Upon initial power-up with the foam tanks empty, the display on the control unit alternates between **0** and **Lo A**, indicating the foam tank is empty.

Fill the foam concentrate tank with WATER. The **Lo A** indication clears from the display, indicating the low tank level sensor is operating properly.

2. Place the bypass valve to the **BYPASS** position to check foam pump operation. Place a calibrated five gallon container at the discharge of the bypass hose.

3. Place the system in simulated flow mode by pressing the SELECT DISPLAY button

(**i**) until the LED under **FLOW** lights. Then press both up ↑ and down ↓ buttons simultaneously.

Set simulated flow value to **100** GPM by pressing UP ↑ or DOWN ↓ button. The display shows **S** at the left most position to indicate the simulated flow. (See Figure 24: “Simulated Flow Display.”)

4. Press the (**i**) button until the LED under **% FOAM** lights. Set foam concentrate injection rate to **1.0** using the UP ↑ or DOWN ↓ button.

5. Cycle the (**i**) button until the LED under **TOTAL FOAM** lights. Press the **ON** button to energize the Hale FoamLogix system.

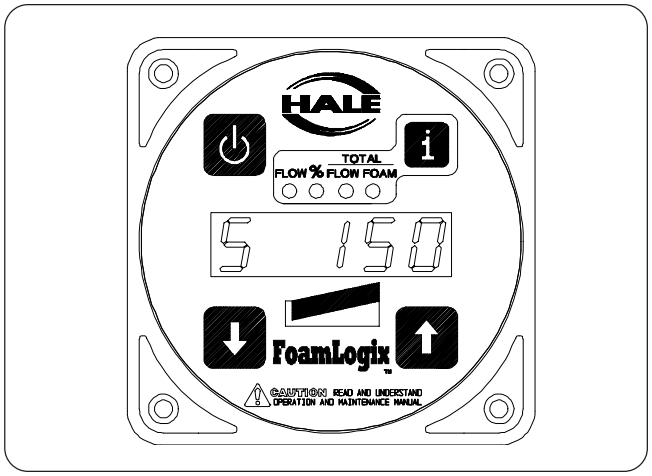


Figure 24: Simulated Flow Display

Observe the discharge at the bypass hose to make sure the foam pump is operating.

6. After one minute press the **ON** button again to STOP the foam pump. Approximately one gallon (3.8 liters) of water should discharge into the container. The TOTAL FOAM display reads approximately **1.0**.

7. Exit the simulated flow mode by selecting the **FLOW** display and pressing both up ↑ and down ↓ buttons simultaneously.

8. Drain water from foam tanks and concentrate lines and return the bypass valve to the **INJECT** position.

9. Verify operation of the flow sensor. Also calibrate the flow sensor using the calibration procedures. See heading “User calibration” beginning on page 53.

This completes the Hale FoamLogix system operation checks accomplished at the system installer facility.

Foam pump feedback calibration along with setting of user specified default simulated flow and concentrate injection rates should be accomplished upon delivery to the end user using actual end user specified foam concentrates and default values.

INSTALLATION AND DELIVERY CHECK LIST

After the Hale FoamLogix system is installed, use the following check list to verify installation and ensure proper system setup when the apparatus is delivered to the end user.

INSTALLATION

DATE	INITIALS	
_____	_____	❑ System properly installed. (Review “Start-Up Check List” on page 48.)
_____	_____	❑ Tank level sensor function verified. (Review “System Installer Start-Up” on page 49.)
_____	_____	❑ Foam pump operation checked. (Review “System Installer Start-Up” on page 49.)
_____	_____	❑ Foam tank and hoses drained of water. (Review “System Installer Start-Up” on page 49.)
_____	_____	❑ Flow sensor function checked and calibrated. (Review “User Calibration” on page 53.)

DELIVERY

DATE	INITIALS	
_____	_____	❑ Foam tank filled with user specified foam concentrate. (Compies with Hale approved concentrate compabibility list.)
_____	_____	❑ Foam pump priming checked.
_____	_____	❑ Flow sensor calibration verified with Pitot.
_____	_____	❑ Default simulated flow value set to end user specification.
_____	_____	❑ Default foam concentrate injection rate set to end user specification.
_____	_____	❑ Foam concentrate feedback value verified and calibrated with end user specified foam.
_____	_____	❑ Proper Hale FoamLogix system operation demonstrated to end user in accordance with manual procedures.

DATE	INITIALS	
_____	_____	❑ End user trained in proper operation of Hale FoamLogix system in accordance with manual procedures.
_____	_____	❑ Warranty registration card filled out by end user and mailed to Hale Products.
_____	_____	❑ Two copies of Description, Installation and Operation manual provided to end user.

NOTES

USER CALIBRATION

The complete Hale FoamLogix Systems; foam pump and motor assembly, control unit and flow sensor, is tested at the factory before shipping to the installer. If the Hale FoamLogix system is properly installed, further calibration IS NOT necessary until delivery to customer.

The system permits easy checking of component calibration to assure accurate operation. The calibration process verifies component calibration and allows adjustments to the flow sensor and feedback sensor display readings, to allow for variations in apparatus piping configurations and end user selected foam concentrate.

Default values for simulated flow and foam concentrate injection rate may be set to end user specifications while in the calibration mode.

Note: The Hale FoamLogix system is calibrated at the factory to U.S. measurement (GPM, PSI, GALLONS, etc.) units. The system may be set to Metric units. (See heading “English to Metric Units” on page 58.) However, the same unit of measurement must be used throughout the calibration process to ensure proper proportioning by the system.

Recalibration of the system may be required ONLY after major repairs or component changes are made to the Hale FoamLogix foam system. Different viscosity foam concentrates may also required recalibration.

ENTERING PASSWORDS

Entering passwords is accomplished using the control unit function buttons.

To enter passwords, press and hold the **DISPLAY** button. The display shows **PASS,** then clears. While continuing to hold the display button press the ↑ or ↓ buttons sequentially to enter the password. See Table 25: “Password Sequence.”

Mode	Password Sequence
User Calibration	↑↑↑↑
Restore Factory Defaults	↑↑↓↑

Table 25: Password Sequence

RESTORE FACTORY DEFAULTS

To return to the factory default values, enter the restore factory values password (↑↑↓↑) as previously described.

Once the password is entered correctly the unit displays **FAC** and returns to normal operation.

Factory default values:

Simulated Flow.... 150 GPM (568 LPM) %
FOAM ..... 0.5% Class “A”

Also see Figure 26: “Display - Password and Calibration Modes” on page 54.

CALIBRATION

1. To enter calibration password press and hold the SELECT DISPLAY button (**i**). The display shows PASS, then clears.
2. While holding **i** pressed, enter the calibration password (↑↑↑↑).
3. The display shows **CALL** for several seconds, followed by **L** *(or* **O** when display is set to metric). (See Figure 26: “Display - Password and Calibration Modes” on page 54.)

   The **FLOW** LED (Water Flow sensor Calibration) also illuminates. (See Figure 27: “Display - Flow Sensor Calibration” on page 54.)

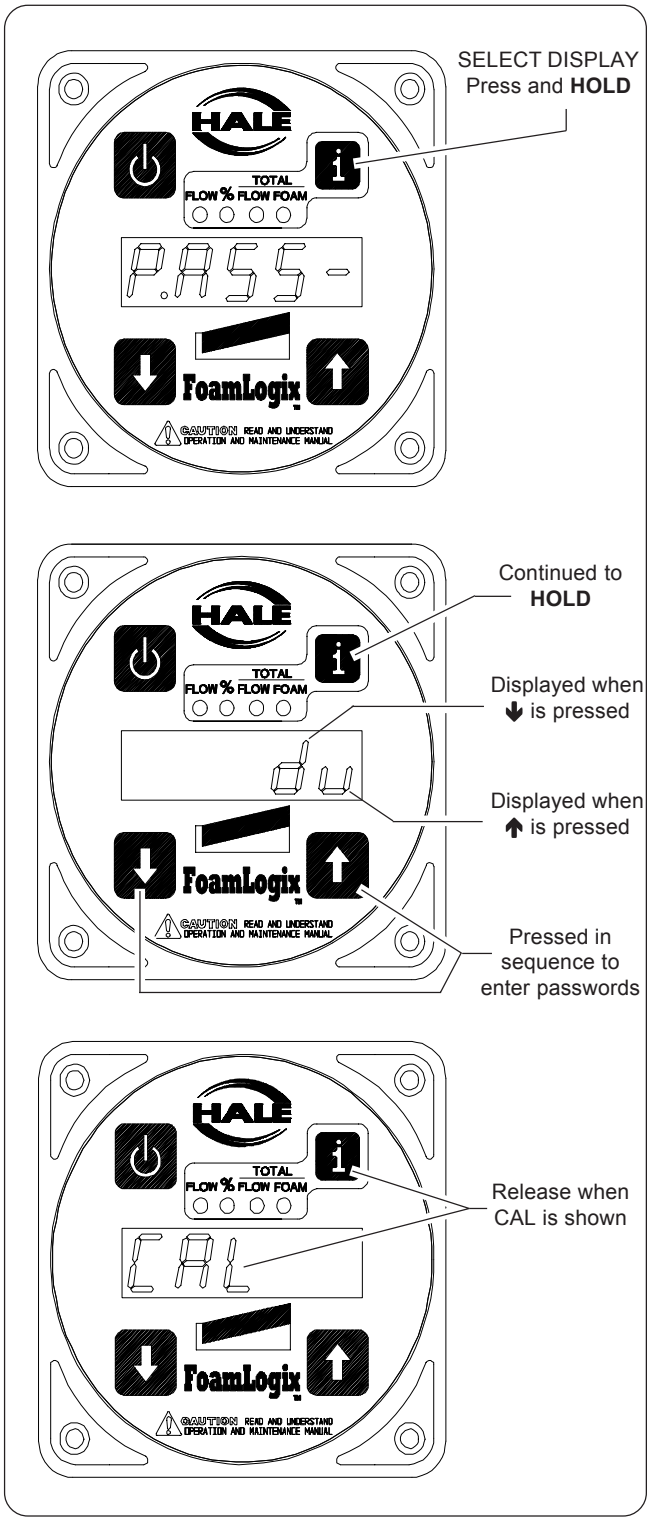
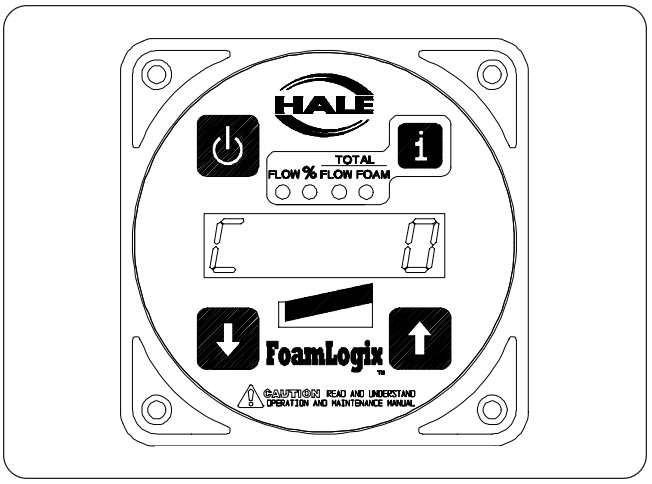


Figure 26: Display - Password and Calibration Modes



27: Display - Flow Sensor Calibration

FLOW SENSOR CALIBRATION

Verify flow sensor calibration during NFPA/UL testing of the apparatus and delivery to end user.

IMPORTANT!

AN ACCURATE FLOW MEASURING DEVICE MUST BE USED TO MEASURE THE WATER FLOW WHEN CALIBRATING THE FLOW SENSOR. USE A SUITABLE SIZE, SMOOTH BORE, NOZZLE AND AN ACCURATE AND CALIBRATED PITOT GAUGE INSTRUMENT. HAND HELD PITOT GAUGES ARE USUALLY NOT VERY ACCURATE.

MAKE SURE THE SYSTEM IS CALIBRATED WITH AN ACCURATE FLOW MEASURING DEVICE.

1. Determine the water flow normally expected from the discharge outlet and establish flow.

2. Make sure the water flow established is within the range of the flow sensor monitoring the discharge.

   For example, establish a flow rate of 150 GPM (568 LPM) of water through a nozzle and Pitot system. Compare the calculated flow value to the value shown on the control unit display.

3. Press the ↑ or ↓ button and set the reading to match the actual flow calculated from the Pitot gauge reading.

4. Decrease fire pump pressure by approximately one half (1/2) and recalculate water flow rate.

   Verify the reading on the control unit is within 5% of the actual value.

5. STOP the water flow when adjustments are completed.

Record Flow and Sensor Calibration Factors

Press and release the **i** button. The display show **F xx.x**, which is the water flow sensor calibration factor (See Figure 28: "Display Flow Sensor Calibration Factor.")

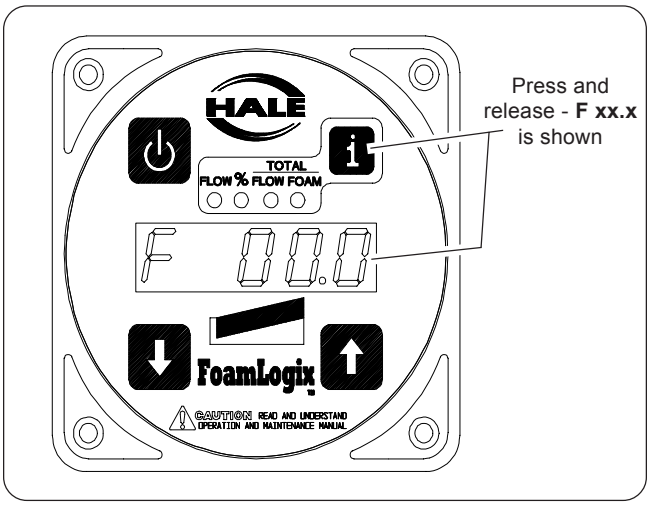


Figure 28: Display - Flow Sensor Calibration Factor

Record this value for future reference. This factor must be programmed into the display if the display is ever replaced.

WATER FLOW SENSOR CALIBRATION FACTOR: _____

SIMULATED FLOW

The default Simulated Flow value is factory set to 150 GPM (568 LPM) and, if necessary, may be adjusted while in the user calibration mode.

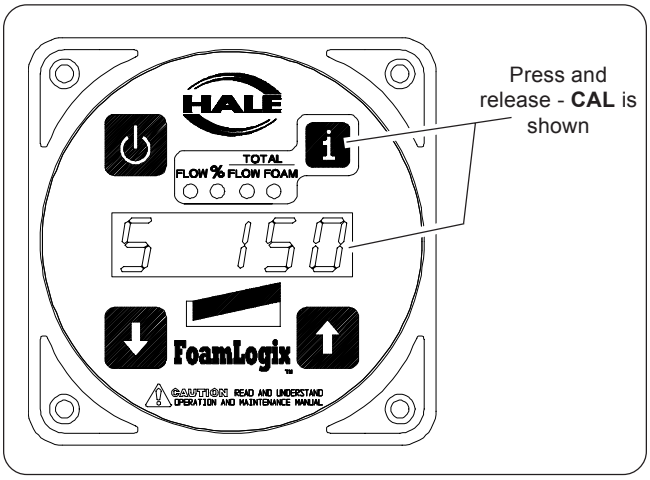


Figure 29: Display - Simulated Flow Calibration

Press the **i** button. The default simulated flow rate is shown. (See Figure 29: "Display - Simulated Flow Calibration.")

Adjust the setting to the required rate by pressing the ↑ or ↓ buttons (e.g., **S 150**).

FOAM CONCENTRATE INJECTION RATE

When the Hale FoamLogix system power is turned ON, the foam concentrate injection rate stored in memory is the default setting. The user specific default concentrate injection rate is adjusted in calibration mode.

1. Press the **i** button.

The display shows the current default concentrate injection rate stored in the computer memory for the selected foam concentrate tank. (See Figure 30: "Display Foam Concentrate Injection Rate Default Value" on page 56.)

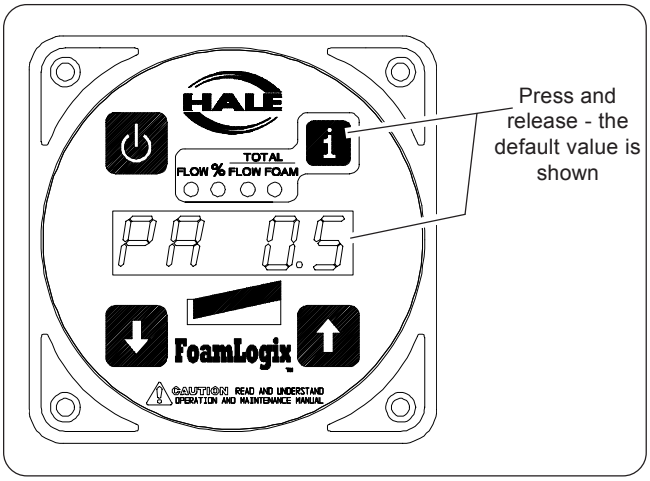


Figure 30: Display - Foam Concentrate Injection Rate Default Value

2. If the factory default values have not been changed the display shows **PA 0.5**.

3. Use the ↑ or ↓ buttons to set the user specified default concentrate injection rate.

FOAM PUMP FEEDBACK CALIBRATION

IMPORTANT!

FOAM PUMP FEEDBACK IS CALIBRATED AFTER INSTALLATION TO VERIFY VALUES WITH THE ACTUAL FOAM CONCENTRATE(S) BEING USED. ONLY CALIBRATE USING ACTUAL FOAM CONCENTRATES.

DO NOT USE WATER, TRAINING OR TEST FOAMS FOR FEEDBACK CALIBRATION VERIFICATION.

1. Press the **i** button.

The display shows **A x.xx,** the total volume of foam concentrate pumped during the last calibration run. (See Figure 31: “Display - Foam Pump Feedback Calibration.”)

2. Set the bypass valve to the **BYPASS.**

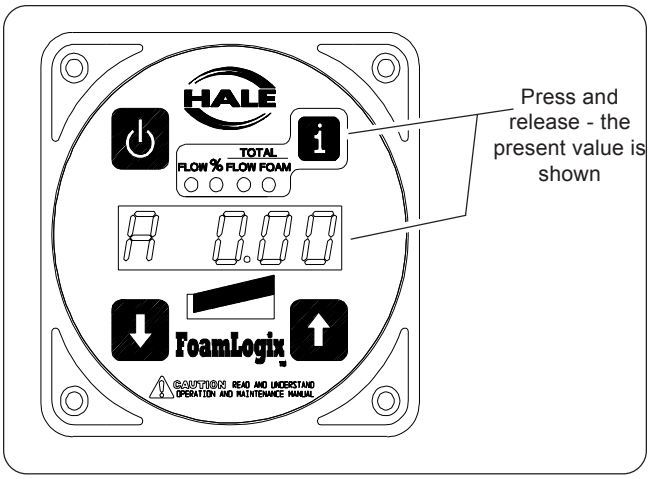


Figure 31: Display - Foam Pump Feedback Calibration

3. Place a graduated measure container at the outlet of the bypass hose capable of containing the expected volume of foam concentrate, 5 gallons (19 liters) minimum.

(See Figure 32: “Foam Concentrate Collection.”)

Note: If an accurate calibrated container is not available an accurate scale can be used to weigh the foam concentrate pumped. The total volume of foam concentrate is then calculated from this weight and the density of the foam concentrate per the MSDS sheet.

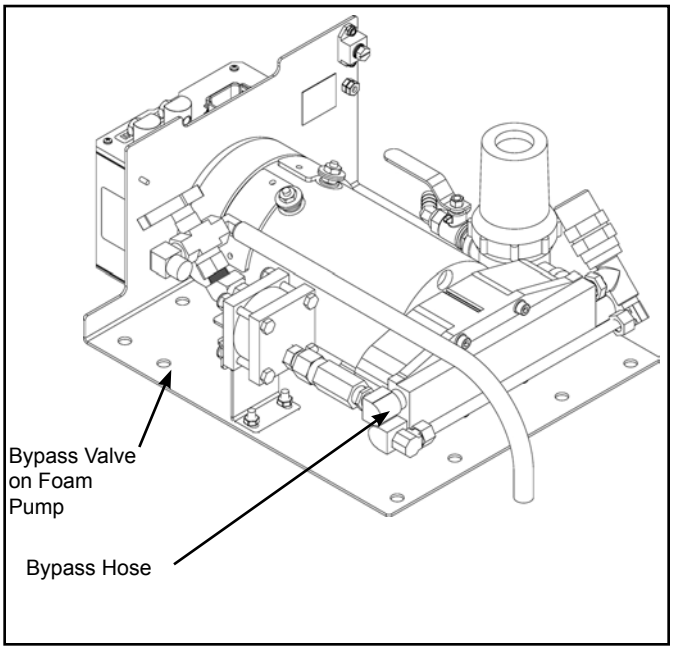


Figure 32: Foam Concentrate Collection

4. Start the Hale FoamLogix foam pump by pressing the red **ON** button.

   The LEDs on the horizontal bar graph lights as the foam pump begins operating at approximately two-thirds speed, pumping foam concentrate into the container.

   The display shows the volume of foam concentrate being pumped.

5. STOP the foam pump and accurately measure the amount of foam concentrate collected.

6. Adjust the reading on the display to match the volume actually pumped using the ↑ or ↓ button.

7. Repeat the procedure to verify the setting is correct.

8. Set the bypass valve handle back to **INJECT** position.

Record Foam Pump Feedback Calibration Factor

1. Press and release the **i** button.

   The display shows **FA xxx**,the foam pump feedback calibration factor. (See Figure 33: "Display - Foam Pump Feedback Calibration Factor.")

2. Record this value for future reference. This factor must be programmed into the display if the display is ever replaced.

FOAM PUMP FEEDBACK CALIBRATION FACTOR: _____

EXIT AND SAVE CALIBRATION

1. To exit calibration and save the set values, press and hold the **i** button.

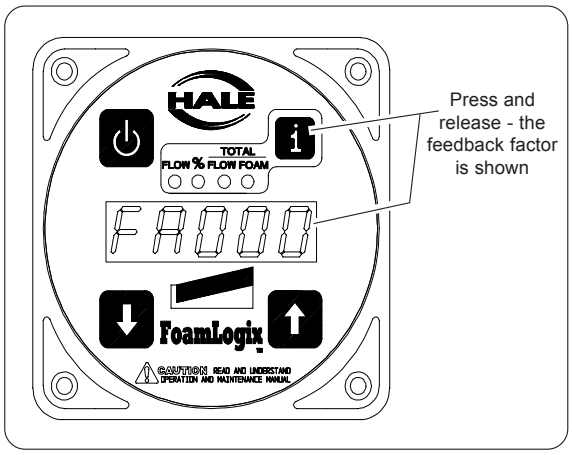


Figure 33: Display - Foam Pump Feedback Calibration Factor

The display show **PASS**, then clears.

2. While continuing to hold the display button enter the password (↑↑↑↑).

3. The display shows **SCAL** for several seconds and then cycles through the start-up sequence followed by the flow display **O**. (See Figure 34: "Display - Exit and Save Calibration.")

This completes verification and adjustment of the system. The Hale FoamLogix system is now ready to be placed in service.

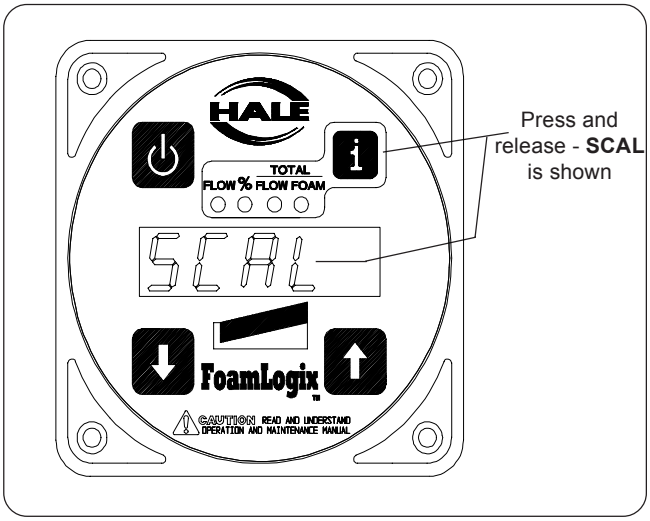


Figure 34: Display - Exit and Save Calibration

RELIEF VALVE

The pressure relief valve is factory tested and set to 300 PSI (21 BAR). (See Figure 35: “Relief Valve.”)

During normal installation and operation, the relief valve does not require adjustment.

If adjustment is necessary during field installation, contact Hale Products Inc. at 610-825-6300 for Relief Valve Service information.

ENGLISH TO METRIC UNITS

The FoamLogix Display offers both English and Metric readouts.

The Hale FoamLogix system is calibrated at the factory to U.S. measurement (GPM, PSI, GALLONS, etc.) units.

To convert to Metric units:

1. Press and hold the **i** button. The display show **PASS**, then clears.
2. While continuing to hold the display button enter the password (↓ ↑ ↑ ↓) .
3. The display shows **IN** to indicate Metric units are selected.

Note: Switching to English is accomplished by repeating Steps 1 through 3. The display shows **EN** to indicate English units.

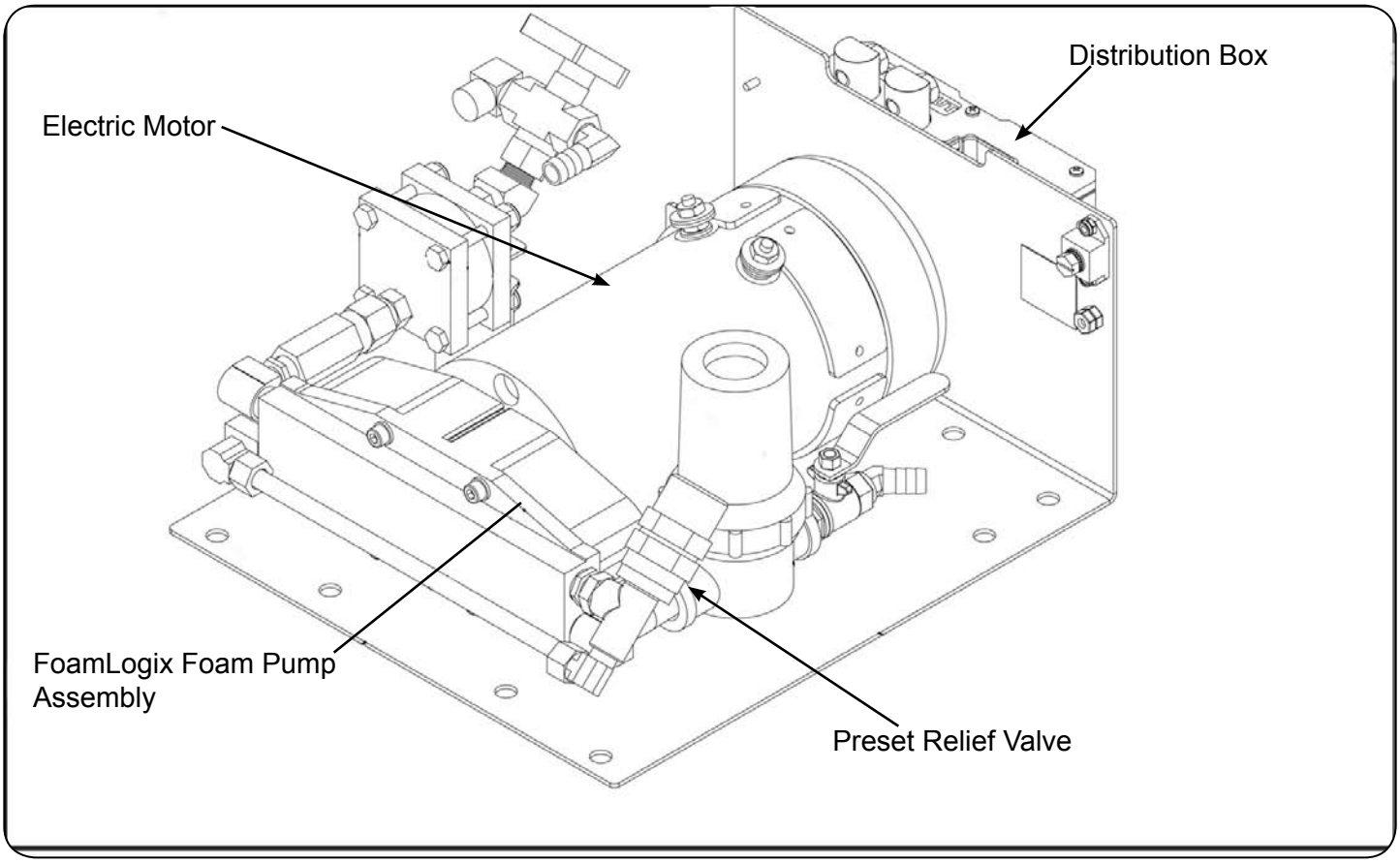


Figure 35: Relief Valve

Section 4 Operation

DESCRIPTION

Operation of Hale FoamLogix systems is controlled by the Digital Display Control Unit, provided with four push buttons (pads). (See Figure 36: “Digital Diaplay Control Unit Overview.”)

The Hale FoamLogix system constantly monitors water and foam concentrate flow values, maintaining foam injection at the specified concentrate injection rate. The system responds to variations in water flow by increasing or decreasing the speed of the foam pump.

On initial power up of the apparatus, the Hale FoamLogix system begins a brief self-diagnostic routine. When completed, the system enters the STANDBY mode. The **FLOW** LED lights and the dsiplay shows the current water flow rate in the monitored discharge pipe.

Pressing the DISPLAY button (i) cycles through the four functions as indicated by the red LED illuminating under each function.

may be reset any time they are displayed. When the **% FOAM** LED is lit, or in any other function mode, the foam concentrate injection rate may be set to the desired value, if different from the default value. This may be adjusted prior to or during foam operations by pressing the ↑ and ↓ buttons. Also see heading “Control unit functions” on page 60.

When the red **ON** button is pressed, the **FLOW** LED illuminates indicating that the system is ready. If water flow is present the foam pump starts and injects foam concentrate into the discharge stream.

The bar graph lights when foam is being injected and indicates system capacity.

When the **ON** button is pressed again the LEDs extinguish, indicating that the system is in STANDBY mode and the foam pump STOPS. However, other system monitoring functions continue.

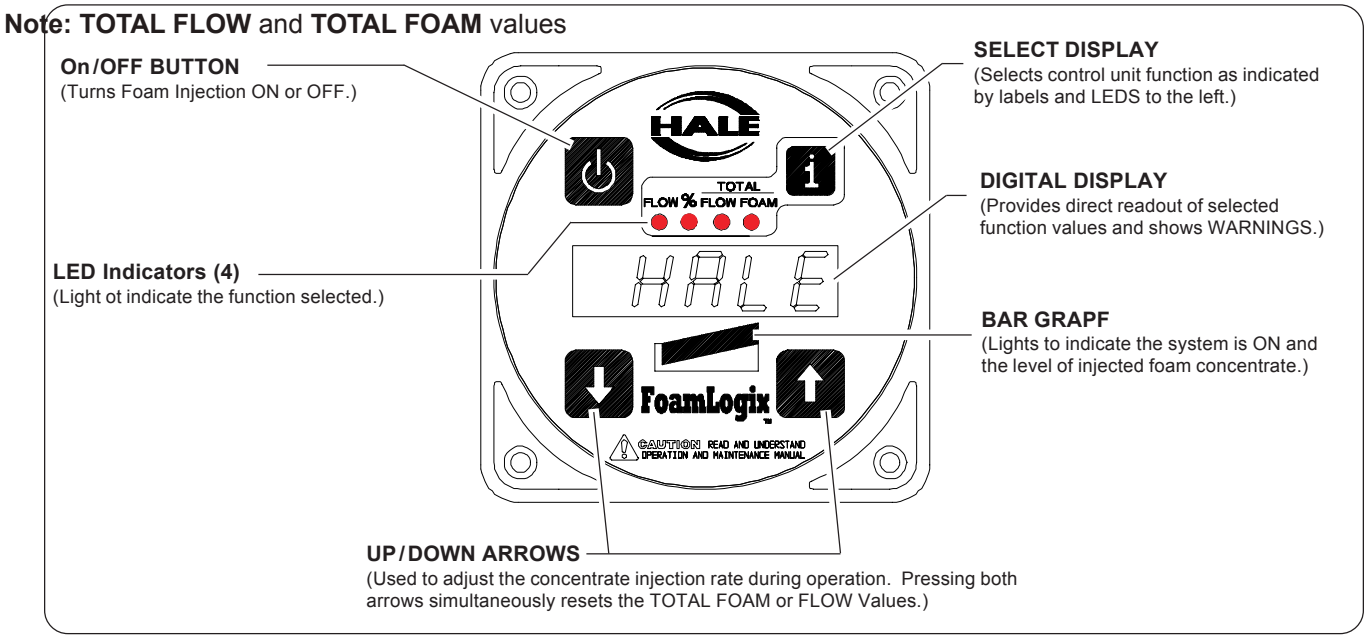


Figure 36: Digital Display Control Unit Overview

DISPLAY INFORMATION

The five digit display on the control unit shows the value of the selected function or provides WARNINGS to the operator as the system is operating.

A function is selected by pressing the grey DISPLAY button (**i**). Each time the button is pressed a new function mode is selected and displayed. LEDs above the digital display denote which function is selected.

Pressing the DISPLAY button (**i**) changes the control unit functions but does not affect injection rate.

Control Unit Functions

See Figure 37: “Display - Function Modes.”)

FLOW

The display shows the current flow rate of water or foam solution per minute in Hale flow sensor monitored discharges.

% FOAM

The display shows the foam concentrate injection rate setting in the % **FOAM** mode (e.g., **A 0.5**).

TOTAL FLOW

The display shows the total amount of water or foam solution pumped through flow sensor monitored discharges. This totalized value may be reset - see heading using procedures outlined in the “Reset Functions” paragraph.

TOTAL FOAM

The display shows the total amount of foam concentrate pumped.

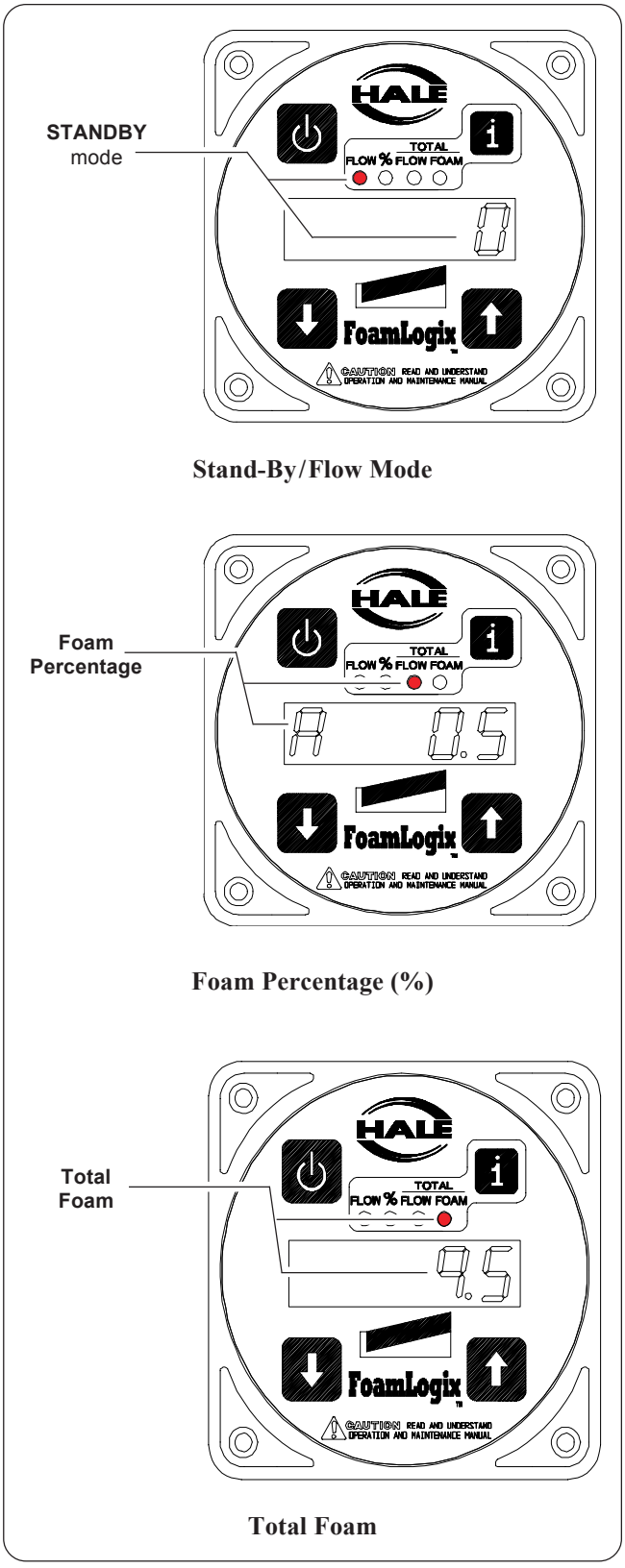


Figure 37: Display - Function Modes

The value is in the same unit of measure as the water flow. This totalized value may be reset - see heading “Reset Function”.

For example, the display may show **9.5**, indicating 9.5 gallons (36 liters) of foam concentrate have been used. (See Figure 37: “Display - Function Modes” on page 60.)

Bar Graph

The bar graph consists of a ten (10) LED array. When the ON button is pressed the left-most LED lights to indicate the system is ON and ready to inject foam concentrate.

When water is flowing, LEDs to the right on the bar graph light indicating foam concentrate is being injected. The amount of LEDs lighted provides an indication of the approximate pump capacity being used.

If water flow requirements exceed the capacity of the pumps ability to deliver foam concentrate, pump speed increases to the maximum rate. All bar graph LEDs light and the right-most LED flashes, warning the operator that the system capacity is being exceeded and is running “lean” on foam concentrate percentage.

If the flow decreases such that the required injection rate is less than the lowest rating of the pump, pump spped decreases to its minimum rate and the first bar graph LED to the left flashes, warning the operator that the system capacity is being exceeded and is running “rich” on foam concentrate percentage.

RESET FUNCTIONS

The totalized values for water and foam concentrate pumped are cleared from memory by performing a **RESET** function.

1. Using the DISPLAY button (**i**), select either **TOTAL WATER** or **TOTAL FOAM**.
2. By pressing and holding both the ↑ and ↓ buttons at the same time, the value shown is cleared and the display shows zero (0).
3. Additionally the totalized values for water and foam concentrate reset to zero automatically when the apparatus power is turned OFF.

FOAM CONCENTRATE INJECTION RATE

When **% FOAM** is selected, the ↑ and ↓ buttons respectively increase or decrease foam concentrate percentage.

While operating in any function, with the exception of **FLOW** during simulated flow operation, whenever the ↑ or ↓ buttons are momentarily pressed, the display switches to the **% FOAM** display and shows the current injection rate for 2 seconds.

In any display mode, if either the ↑ or ↓ button is held down for a period of 2 seconds or more, the injection rate value increases or decreases accordingly. Once released, the display returns to the last selected display after 2 seconds.

When a reset is performed in the **% FOAM** display mode, the foam concentrate injection rate returns to the default value.

WARNING MESSAGES

Several safety features are incorporated into the Hale FoamLogix system to protect the foam concentrate pump, electric motor and apparatus wiring while maintaining personnel safety.

Messages appearing on the display alert the

operator to adverse conditions that could cause damage to Hale FoamLogix system components, the apparatus and cause personnel injury.

Low Foam Tank Level

The Hale FoamLogix foam pump is interlocked with the foam concentrate tank level switch. If the tank is empty, the pump runs for 1 minute. The low foam concentrate tank level message is shown (**Lo A**)alternating with the normal selected function on the display. See Figure 38: “Display Low Foam Tank Display.”

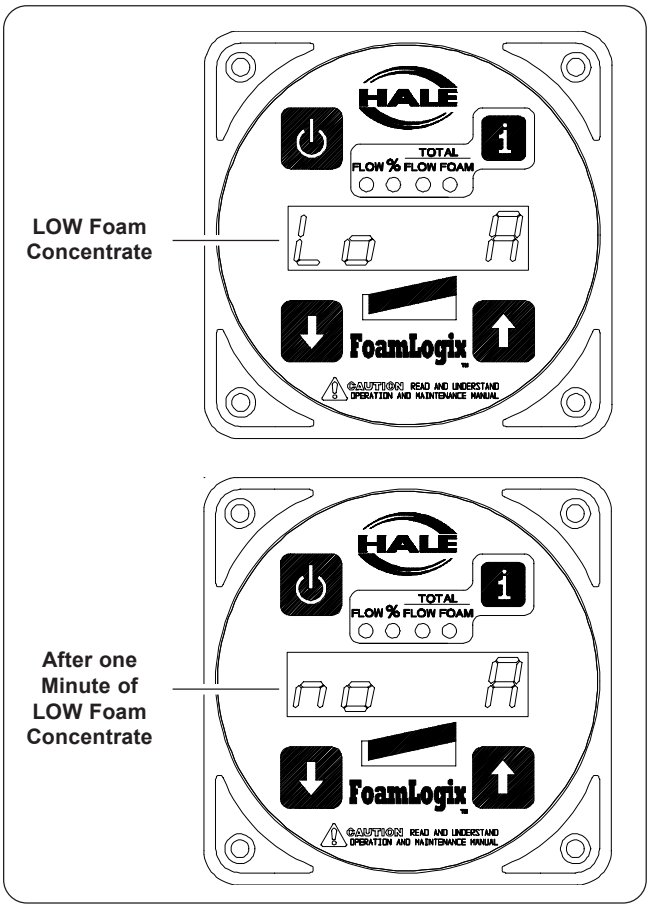


Figure 38: Display - Low Foam Tank

If one minute of low concentrate level is detected the display shows no A, and the pump STOPS. The left-most LED turns OFF until the foam level is restored and the ON button is pressed.

If the **ON** button is pressed before refilling the foam tank, the system runs for 30 seconds before shutting down again.

Priming Error

In the event there is no feedback signal being received when the foam pump starts, indicating a lack of foam concentrate flow, the foam pump motor runs at full speed attempting to establish foam concentrate flow.

If the system operates for a period of 45 seconds without a feedback signal the system switches to the STANDBY mode and the display flashes **no Pr** (no prime) indicating there is no foam concentrate flow. (See Figure 39: “Display - Priming Error.”)

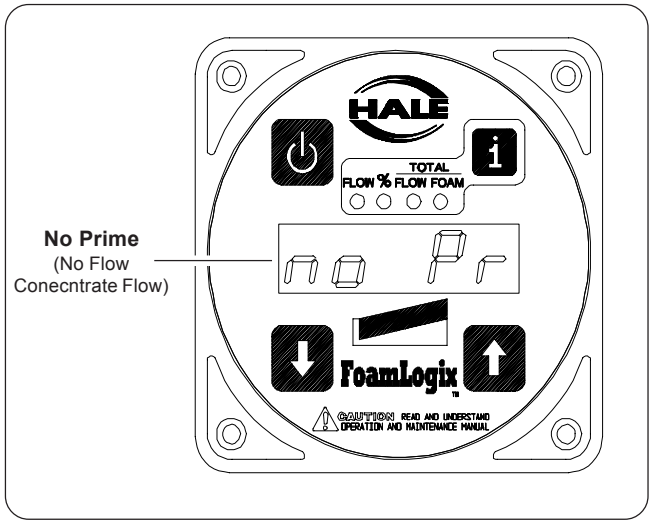


Figure 39: Display - Priming Error

High Ambient Temperature

If the Hale FoamLogix system is operating in an environment of excessive ambient temperatures, the display shows **HIGH**.

If the circuitry in the Hale FoamLogix system is being affected by a drop in power supply voltage the display shows **Lo SP**.

See Figure 40: “Display - High Temperature and Low Battery” on page 63.

Note: This is not necessarily an indication of apparatus battery level or condition. It is only an indication of adverse operating conditions. For instance a bad battery cable can cause the system to see low power even though the batteries are fully charged.

In either case the system continues to run. If conditions deteriorate to the point of potential system damage, due to heat or low power, the system returns to the STANDBY mode and the error message remains until **ON** is pushed again.

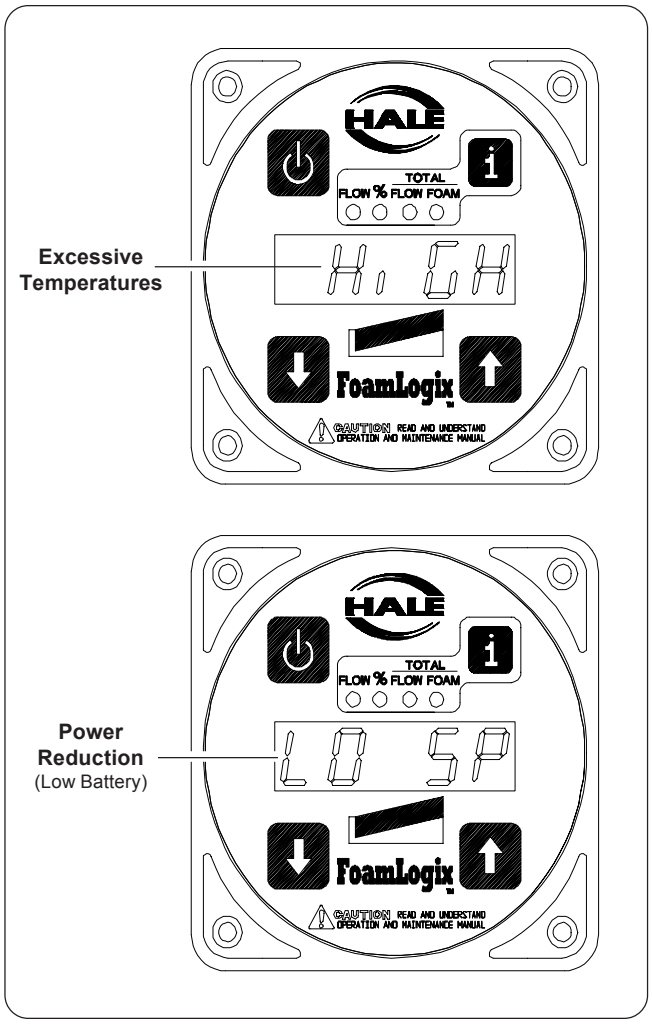


Figure 40: Display - High Temperature and Low Battery

PRIMING THE FOAM PUMP

(When the Foam Tank Runs Dry)

In some instances, the foam tank may run dry while operating the Hale FoamLogix system. The foam pump is designed to pump liquid. When the fire pump is running the foam pump may not pump efficiently against 100 to 150 PSI (7 to 10 BAR) back pressure. To re-establish foam concentrate flow quickly the following procedure is used.

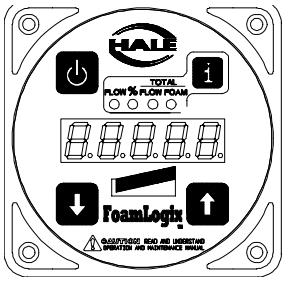
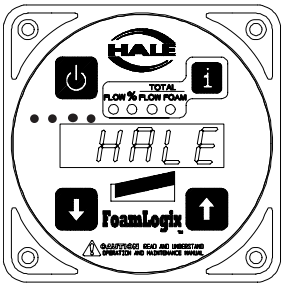
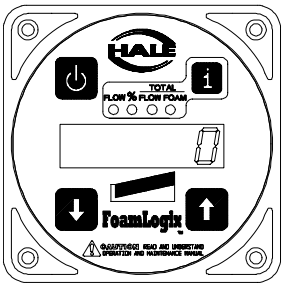
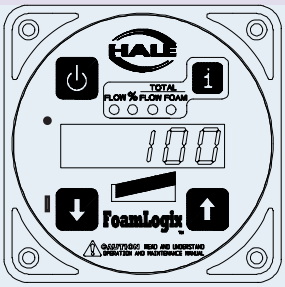
1. Turn the bypass valve to the **BYPASS** position.

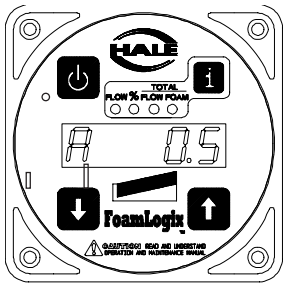
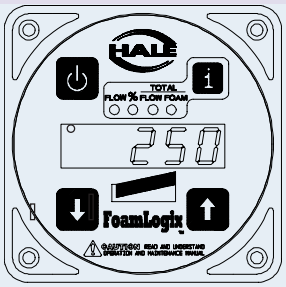
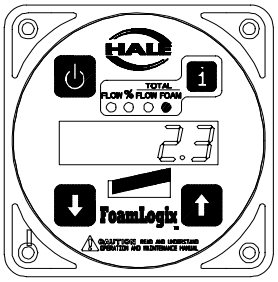
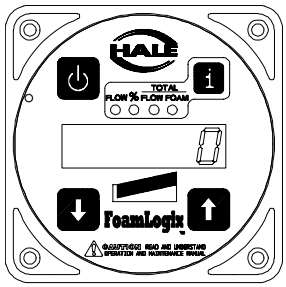
2. With the fire pump flowing water from foam discharge and the Hale FoamLogix ON, observe the hose from the bypass valve.

3. When foam concentrate flows from the hose turn the bypass valve back to the **INJECT** position.

The pump is now primed and ready for normal operation.

NORMAL OPERATION SUMMARY

OPERATION	ACTION	DISPLAY
Energize the system	Energize apparatus and turn FoamLogix power switch to **ON.**	**Initial StarUp** 
		Self Diagonstics 
Select foam tank	If System equipped with dual foam tanks place selector toproper tank.	 **STANDBY Display** (Single Flow Sensor: FLOW MULTIPLE Flow Sensor: % FOAM)
Begin foam injection	Establish water flow and press **ON** button.	**Water Flow Established** (ON Button Pressed) 

OPERATION	ACTION	DISPLAY
Change injection rate **Read injection rate**	Press ↑ or ↓ and hold for 2 seconds. Release once rate is set. Press and release ↑ or ↓ Display shows injection rate and returns to selected function after 2 seconds.	Foam Concentrate Injecion Rate 
Read total water or foam solution	Press **i** until LED below TOTAL FLOW turns ON.	Total Flow 
Read total foam concentrate	Press **i** until concentrate LED below TOTAL FOAM turns ON.	Total Foam 
Reset totalized values	While in TOTAL FLOW or TOTAL FOAM press and release ↑ and ↓	
End foam injection	Press **ON** button.	 **STANDBY MODE** (Single flowsensor: Flow multiple Flow sensors: % FOAM)

SIMULATED FLOW OPERATION

The Simulated Flow mode of the Hale FoamLogix system allows operation of the foam pump without discharging water through a foam capable discharge or when the flow sensor is not functioning.
The simulated flow mode is used for draining the foam tank for:

- ❑ Cleaning
- ❑ Checking calibration of the feedback sensor
- ❑ Verifying foam pump operation
- ❑ Manually controlling foam injection if the flow sensor malfunctions.

The factory default simulated flow rate is 150 GPM (568 LPM). The simulated flow rate and the concentrate injection percentage rate are set by the rate adjustment buttons on the control unit display, while in simulated flow mode.

The simulated flow function provides manual operation of the foam injection system required by NFPA standards.

CAUTION!

WHEN OPERATING THE HALE FOAMLOGIX IN SIMULATED FLOW MODE AN OUTLET FOR THE FOAM CONCENTRATE MUST BE PROVIDED TO PREVENT EXCESSIVE PRESSURE BUILDUP IN DISCHARGE PIPING OR HOSES.

Simulated flow sequence

1. Uncoil and place the end of the bypass hose into a suitable container to collect the foam concentrate.

2. Place the BYPASS valve in the **BYPASS** position.
3. Energize the apparatus electrical system and press Hale FoamLogix power button (**i**) to turn ON the system.
4. The Hale FoamLogix enters the STANDBY mode. (See Figure 41: “Display - Simulated Flow Operation.”)

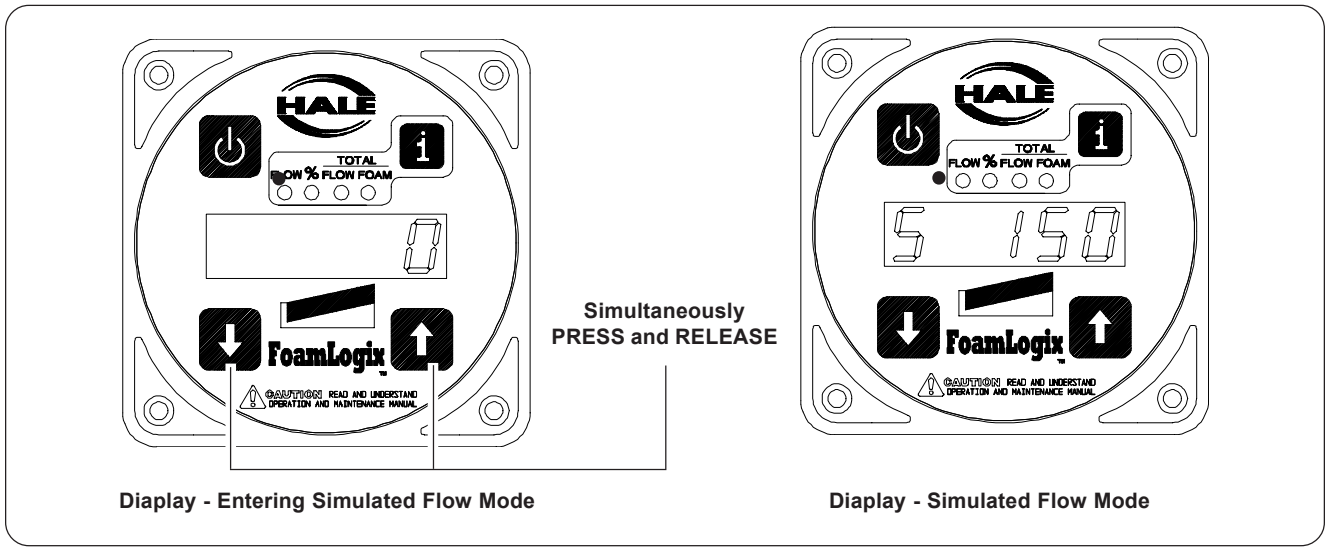


Figure 41: Display - Simulated Flow Operation

1 When the **FLOW** LED lights, press and release the ↑ and ↓ buttons at the same time.

2 The display shows **S 150** (or other preset default value) and the **FLOW** LED lights. (See Figure 41: “Display - Simulated Flow Operation” on page 64.)

3 Press the **ON** button. The left-most LED on the bar graph lights and the foam pump begins running.

Foam concentrate flows out of the end of the bypass hose.

To End Simulated Flow

1. First press the **ON** button to STOP the foam pump.
2. Press the **i** button until the FLOW LED lights.
3. Press and release the ↑ and ↓ buttons at the same time. The display shows the current water flow value and the FLOW LED lights.
4. De-energize the apparatus electrical system.
5. Place the bypass valve to the INJECT position.
6. Secure bypass hose in the appropriate compartment.
7. Return apparatus to normal ready condition.

NOTES

SECTION 5 MAINTENANCE

MAINTENANCE PROCEDURES

1. After each use

   Inspect wiring, hoses, flow sensors and connections for tightness, corrosion, leaks and. or damage. Refer to Figure 3 on page 21.

   Flush foam pump if a non-approved foam concentrate is used. Also see appendix A, “Hale Foam concentrate Compatibility” beginning on page 87 for recommended foam concentrates.

2. Monthly

   Remove and clean the foam strainer screen. Flush as required.

3. Monthly

   Verify water flow calibration.

4. Annually

   Verify foam feedback calibration.

5. Every two (2) months

   If an approved foam concentrate has been left in the system, operate foam system to remove the foam concentrate and prevent jelling.

FREEZE PROTECTION

Cold weather transport and cold weather storage of FoamLogix systems:

- When transporting the completed fire apparatus from the OEM to the dealer, and the dealer to the end-user, or, when the end-user decides to store the finished apparatus in an unheated area subject to below freezing temperatures, a FoamLogix winterization process must be used.

- Any water and/or foam concentrate that is in the foam concentrate reservoir, foam concentrate pump, and associated foam system piping/tubing will freeze and then break system components when the system is subjected to subfreezing temperatures commonly found in over-the-road driving during fire truck delivery and transport. The following precautions must also be taken by OEMs, end-users, re-sellers, fire truck dealers, transport agencies, etc., that will be transporting and/or storing the apparatus in below freezing temperatures:

o Drain the foam concentrate storage reservoir in accordance with safe foam concentrate handling practices as outlined by the foam concentrate manufacturer. If the foam reservoir is filled with only water, completely drain the storage compartment of water. After empty, close all drain valves.

o Pour in five gallons (18.93L) of an appropriate antifreeze solution in the foam concentrate reservoir. Consider using an environmentally friendly biodegradable formulation.

o Follow the Installation and operation manual procedure to “prime” the foam pump.

o With the apparatus fire pump in gear, a water supply established, and a discharge hose and nozzle attached to the discharge side of the fire pump, discharge over 100-gpm (380 LPM)from a foam capable discharge.

o Turn the FoamLogix system “on.” Depress the “up” arrow and raise the proportioning rate to 3.0%.

o Continue to discharge water out of the discharge hose for one-minute.

o Shut the FoamLogix system “Off.”

o Shut off the discharge valve and shut the fire pump down. Remove the water supply connection to the fire pump.

- Drain the fire pump, valves and fire pump system accessories.

The foam system is now winterized and ready for cold weather duty transport and/or cold weather storage.

After transport, prior to the placing the unit in service:

- Drain the foam concentrate reservoir of anti-freeze in an environmentally friendly fashion.
- Shut all foam reservoir drain valves.
- Fill the foam reservoir with a Hale approved compatible Class A foam concentrate.
- Establish a water supply to the fire pump and install a discharge hose and nozzle.
- Operate the fire pump and discharge 100-gpm (380 LPM) of water from a foam capable apparatus discharge. Be sure to collect the discharge in an area, to be cleaned-up later, to mitigate any environmental impact that the anti-freeze / foam solution may cause.
- Turn the foam system “on.”
- Depress the “up” arrow and raise the foam injection rate to 3.0%.
- Operate the discharge hose for one minute.
- Shut the foam system “off.” Turn the fire pump “off.” Remove the hose and nozzle. Disconnect the water supply.
- The unit is now ready for service.

SECTION 6 TROUBLESHOOTING

USER DIAGNOSTICS

Power indicator lamps are provided on the distribution box and on the feedback sensor. The LED on the feedback sensor flashes when the sensor is receiving pulses from the flow sensor rotor targets. These LEDs help to ease tracing of power supply faults and eliminates some of the guesswork in troubleshooting. If the system malfunctions make sure the following conditions are checked:

- ❑ All hose connections correct and tight (Refer to appropriate system plumbing diagram in Section 3 “Installation.”)
- ❑ All electrical connections correct and tight (Refer to appropriate system electrical diagram in Section 3 “Installation.”)
- ❑ Apparatus electrical system energized with power supplied to pump panel and Hale FoamLogix.

Once the above conditions are met, proceed to the system troubleshooting section to determine the cause of the malfunction.

Hale FoamLogix systems consist of individual subsystems working together to provide finished foam solution at the proper percentage. Also see heading “System Overview” on page 72.

The system is designed using modular components making troubleshooting and repair easier. Each subsystem has its own set of troubleshooting procedures. The procedures that follow provide a logical flow path to isolate and correct a system failure.

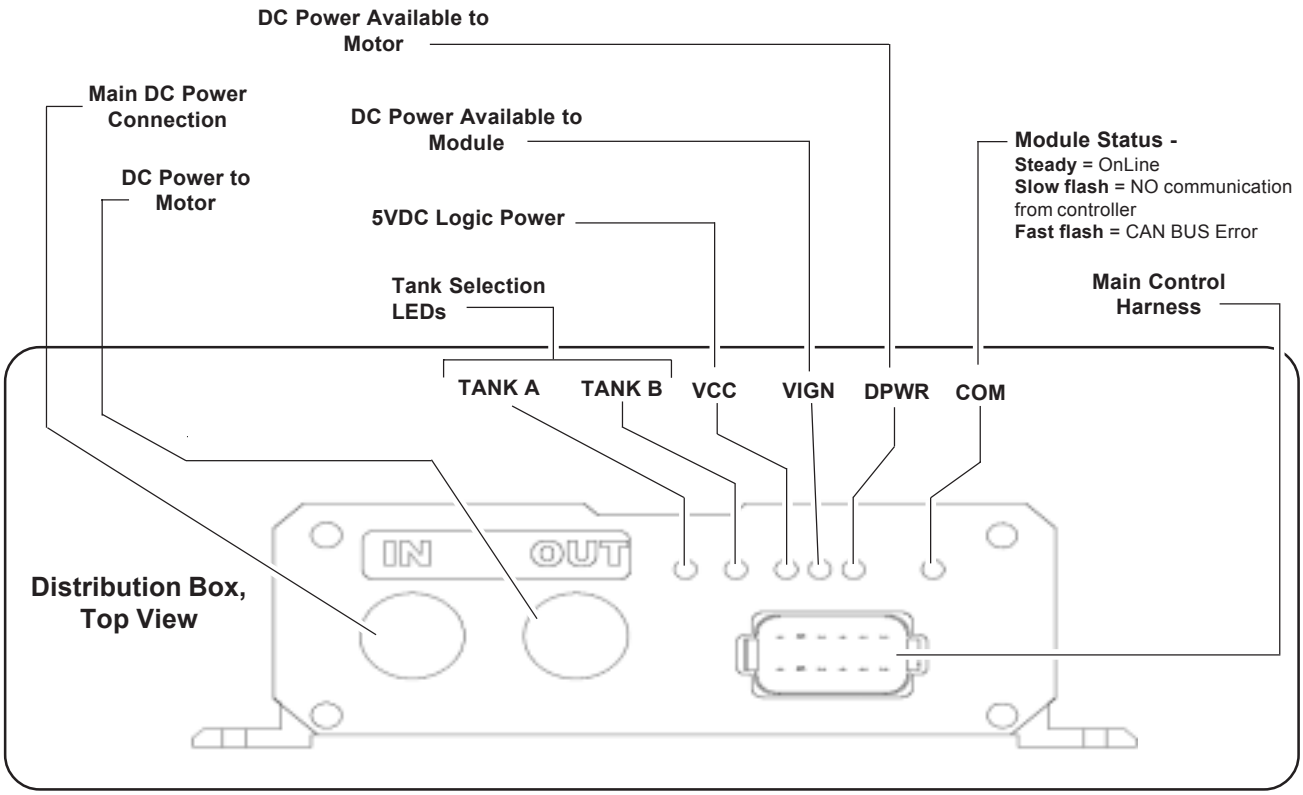


Figure 42: Distribution Box Overview

Note: Hale FoamLogix system electronic components have no user serviceable components inside and are replaced as a unit.
Opening of Hale FoamLogix electronic components voids the manufacturer warranty.

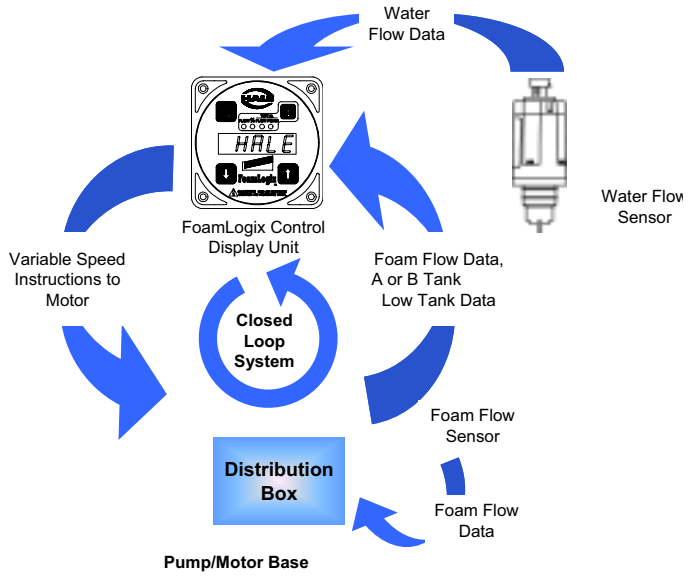


Figure 43: FoamLogix 2.1A & 1.7AHP System Closed-Loop Flow Diagram

System Overview

See Figure 43: “FoamLogix 2.1A and 1.7AHP System Closed-Loop Flow Diagram.”

The FoamLogix 2.1A and 1.7AHP are “closed-loop” systems. The brains behind the system is the computer-controlled FoamLogix Control Display Unit. As an electronic system, the flow of data —”runs“ the system. A basic understanding of how the system functions makes troubleshooting easier.

Water flow data is fed to the control unit computer. Since the injection rate (%) is preset, the control unit calculates the required motor speed of the foam pump and sends this data to the motor. The output of the pump is measured by a foam flow feedback sensor.

The foam flow feedback sensor tells the control unit how much foam is actually pumped so the display can make the required motor speed adjustments. This closed-loop runs several times per second and is what makes the system so accurate.

Note: The FoamLogix unit has a “simulated flow“ function, described in Section 4: “Operation” heading “Simulated Flow Operation“ beginning on page 66. This allows troubleshooting without flowing water, yet *simulates* an actual water flow.

Distribution Box

The Distribution Box, part of the pump/motor assembly, sends data on LOW tank warnings tank selection status, as well as foam concentrate flow feedback to the display.

LOW tank and Tank selection status are also determined within the distribution box. A connector attaches to selector valves. This connection signals the control unit if the unit is in tank selected or flush mode.

If no accessory is used, a connector plug is installed to lock the system in the Tank A mode. (See Figure 20: “Control Harness Connections” on page 45.) Removing this plug or disconnecting the MST accessory cable places the system in the “flush“ mode.

Pump/Motor

The discharge of the foam pump directs foam to the rotary lobe flow meter.

The rotors are a composite material containing small stainless steel targets. As the foam is being pumped, a target lines up with the sensor in the pump head.

The sensor “sees” the target and sends this signal to the control display, through the distribution box. An indicator lamp on the sensor “flashes” as the target passes the sensor. Depending on how much foam is being pump determines the flashing speed, which could be so fast that the indicator light actually appears to be constant.

Bar Graph

The bar graph on the control display unit, indicates the system capacity and is a good troubleshooting tool.

If the display does not see foam feedback data indicating foam is being pumped, the bar graph lights all segments and “flashes.” The display runs the pump fast attempting to prime it and achieve the proper foam concentrate flow.

If the display does not receive data that foam concentrate is flowing, it displays the “**No Pri**” error message, indicating no prime, and turns the system OFF. Pressing ON starts the cycle again. There must be water flow or the unit must be in the simulated flow mode. Operation of the bar graph and no prime warnings are discussed in Section 4, “Operation”.

Summary

Starting with the troubleshooting charts (see Figure 44: “Hale FoamLogix System Troubleshooting Flow Diagram,” to show the flow data, a field problem can be traced to a particular component for replacement.

FoamLogix replacement parts are “plug and-play” type devices that do not require specialized equipment to service. Normal water flow and foam calibration is usually necessary after a major component service.

PROBLEM ISOLATION

The first step in troubleshooting is to determine which subsystem caused the system failure. To make this determination operate the apparatus and Hale FoamLogix system in accordance with standard operating procedures and isolate where the problem occurs.

See Figure44: “Hale FoamLogix System Trouble-shooting Flow Diagram,” beginning on page 74, to assist in isolating the cause. Also review the following steps.

1. Setup the apparatus for normal operation.
2. Power-up the apparatus and energize the pump operator panel. Take notice of the Hale FoamLogix control unit. If the display is NOT illuminated proceed to Figure 44: “Hale FoamLogix System Troubleshooting Flow Diagram,” beginning on page 74.
3. If the Hale FoamLogix control unit is illuminated, engage the apparatus water pump and establish discharge. If water flow CANNOT be established, troubleshoot the water pump system.
4. If there is no indication of water flow on the control unit display troubleshoot the flow sensor.
5. If water flow is established, turn the Hale FoamLogix system ON to flow foam.
6. Observe foam pump discharge. If foam is NOT flowing troubleshoot the foam pump.
7. Check accuracy of system using calibration procedures in Section 4 “Operation” of this manual, making adjustments as required.

TROUBLESHOOTING CHARTS

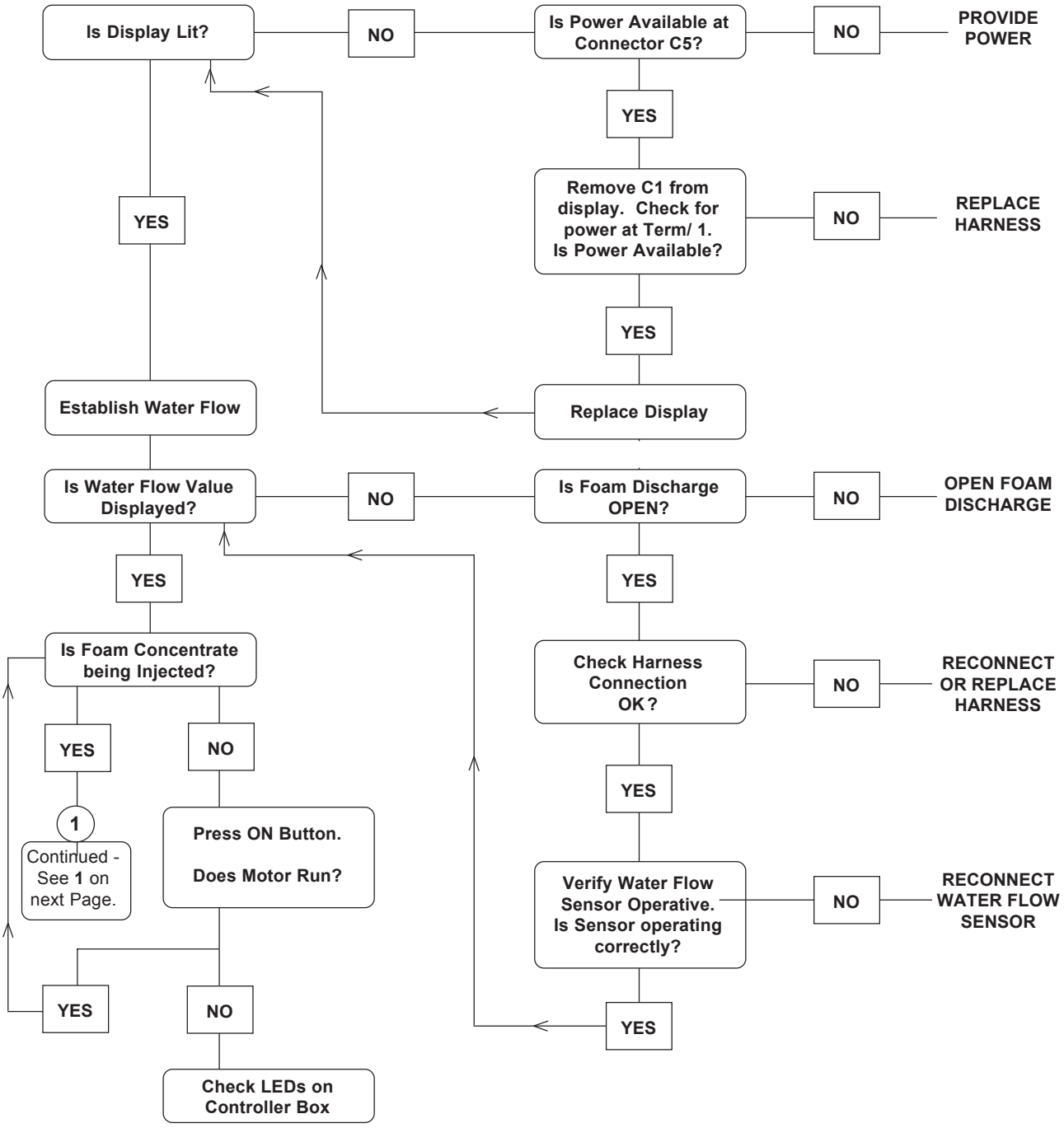


Figure 44: Hale FoamLogix System Troubleshooting Flow Diagram

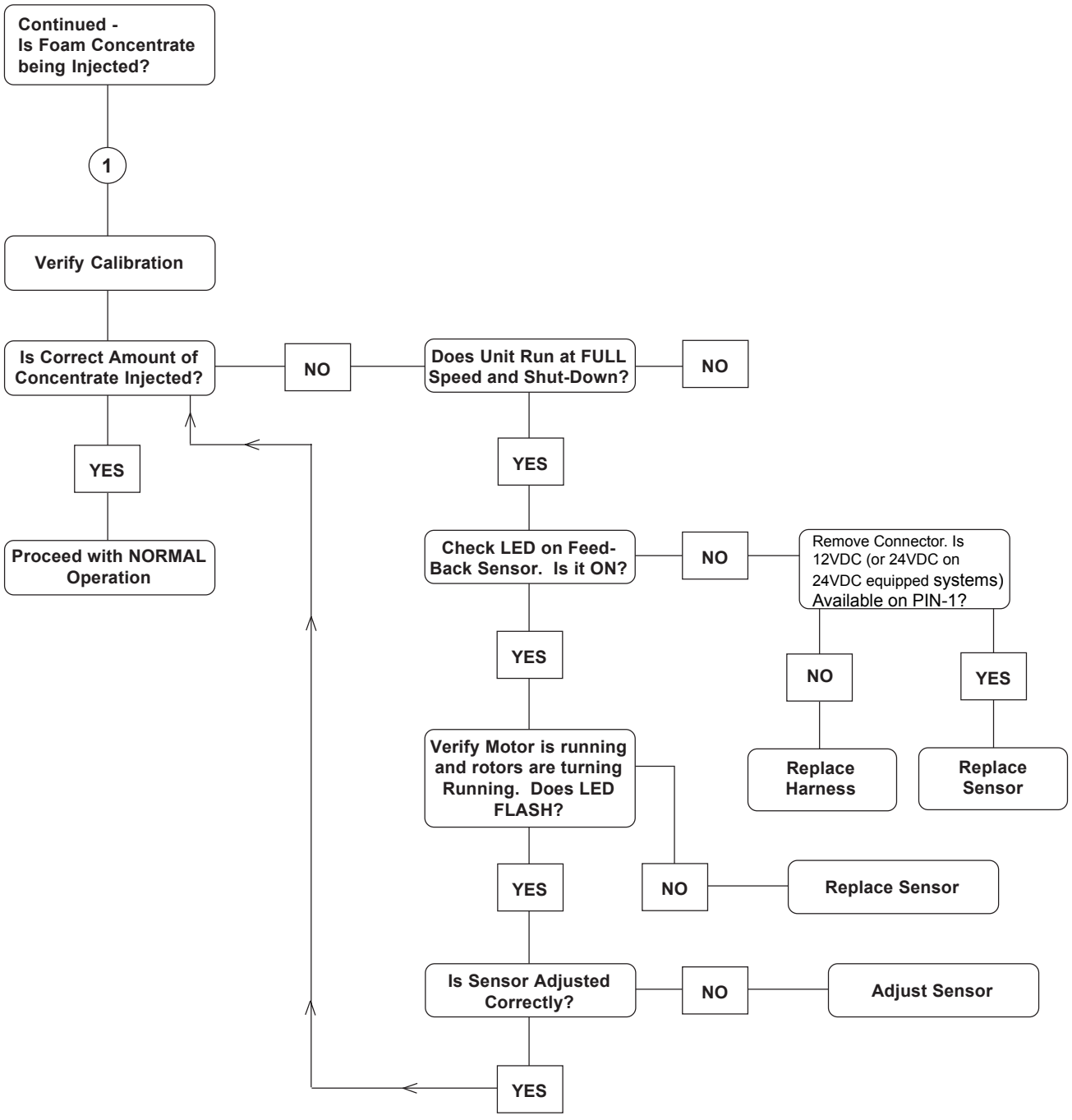


Figure 44: Hale FoamLogix System Troubleshooting Flow Diagram - continued

SECTION 7 ILLUSTRATED PARTS BREAKDOWN

GENERAL

This section contains drawings and the parts breakdown for the serviceable assemblies, components and most commonly used options for the FoamLogix, Model 2.1A Class “A” Electronic Foam Proportioning System.

ABBREVIATIONS

The following abbreviations may be used in this IPB:

A/R..... As required
Cm..... Centimeters
Ext. ..... External
Fwd..... Forward
Ga..... Gauge
Grd, Gr..... Grade – when hardware lists a grade rating, it is imperative to maintain that rating when replacing parts.
HS ..... Hardened Steel
Hex ..... Hexagonal
Id, ID..... Inner diameter
IPB..... Illustrated Parts Breakdown
JIC ..... Joint Industry Conference – an industry standard used to describe a fitting.
Lh, LH..... Left Hand
MM..... Millimeters
Mtg ..... Mounting
n/s ..... Not Shown – parts that are not shown but are servicable.
No..... Number
NPT ..... National Pipe thread
NPTF ..... National Pipe Thread, Fine
OD ..... Outer diameter
p/n ..... Part number
Ref..... Reference
Rev ..... Reverse Rh
RH ..... Right hand
Str..... Straight – usually to describe a hydraulic or pneumatic fitting (vs. elbow)

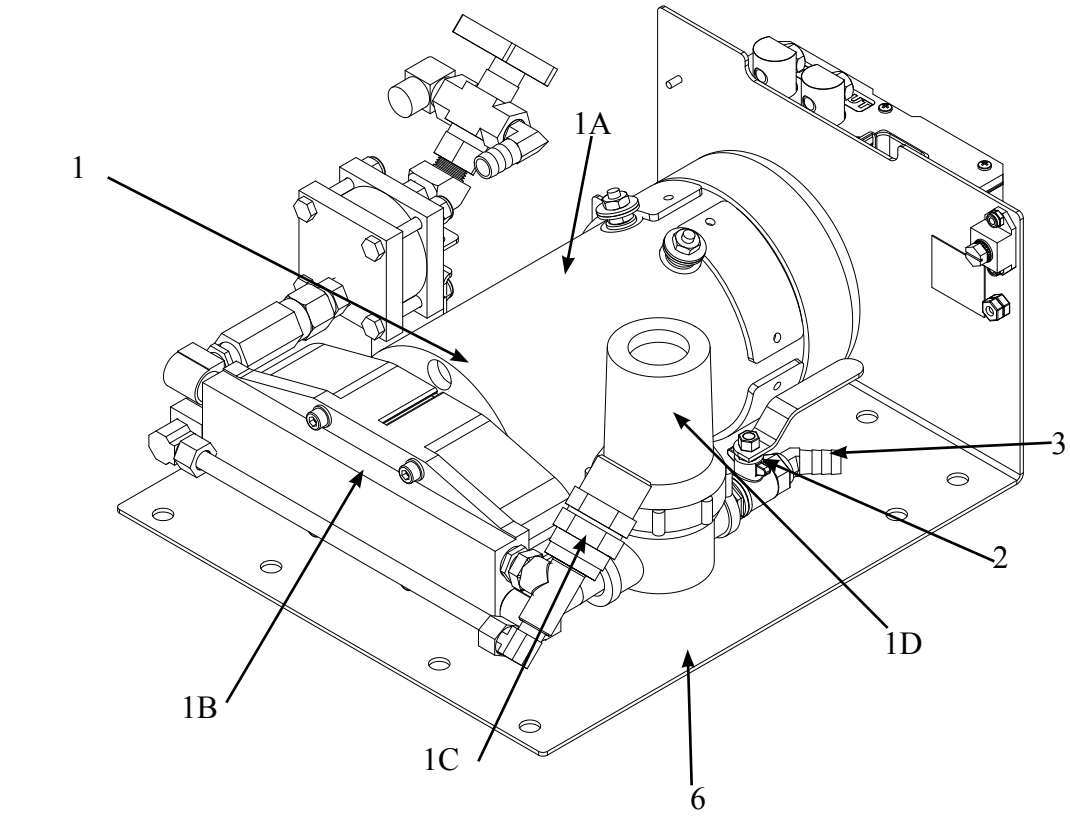
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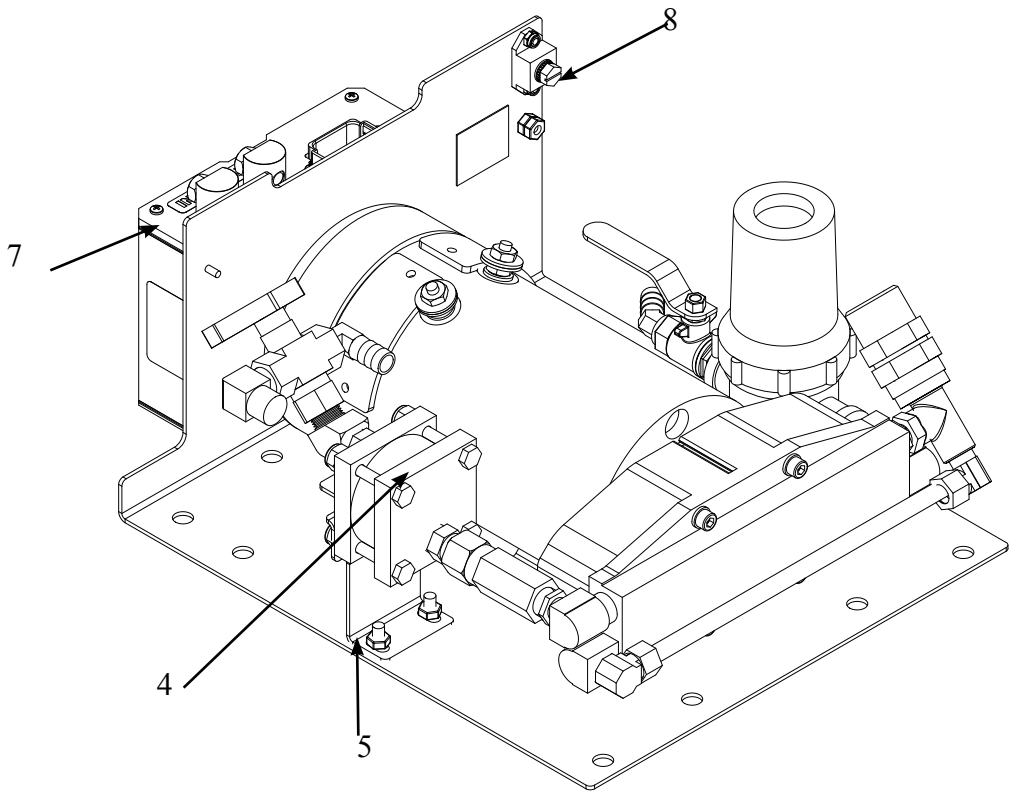
FOAM PUMP ASSEMBLY

1.	114034	1	Motor/Pump Assembly - 2.1A - 12 Volt
	114035	1	Motor/Pump Assembly - 2.1A - 24 Volt
	119274	1	Motor/Pump Assembly - 1.7AHP - 12 Volt
	119275	1	Motor/Pump Assembly - 1.7AHP - 24 Volt
A.	110521	1	Motor 1/2 HP - 2.1A/1.7AHP - 12 Volt
	110393	1	Motor 1/2 HP - 2.1A/1.7AHP - 24 Volt
B.	110522	1	Pump Assembly (without motor) - 2.1A
	119345	1	Pump Assembly (without motor) - 1.7AHP
C.	538-1750-01-0	1	Relief Valve - 2.1A - 250 PSI
	119346	1	Relief Valve - 1.7AHP - 400 PSI
D.	510-0200-02-0	1	Strainer Assembly
2.	119266	1	Ball Valve 3/8” MNPT x FNPT with Handle
3.	082-0328-02-0	1	Elbow 45° 3/8” MNPT x Hose Barb
4.	115497	1	Flowmeter Assembly (see next page for parts list)
5.	019-3770-00-0	1	Flowmeter Mounting Bracket
6.	110618	1	Mounting Base
7.	110586	1	Motor Controller
8.	110589	1	Diode 45V 240A

#1 = Main Assembly
Individual replacement parts are available and shown as “A”, “B”, “C” and “D”

Figure 45: Foam Pump Assembly

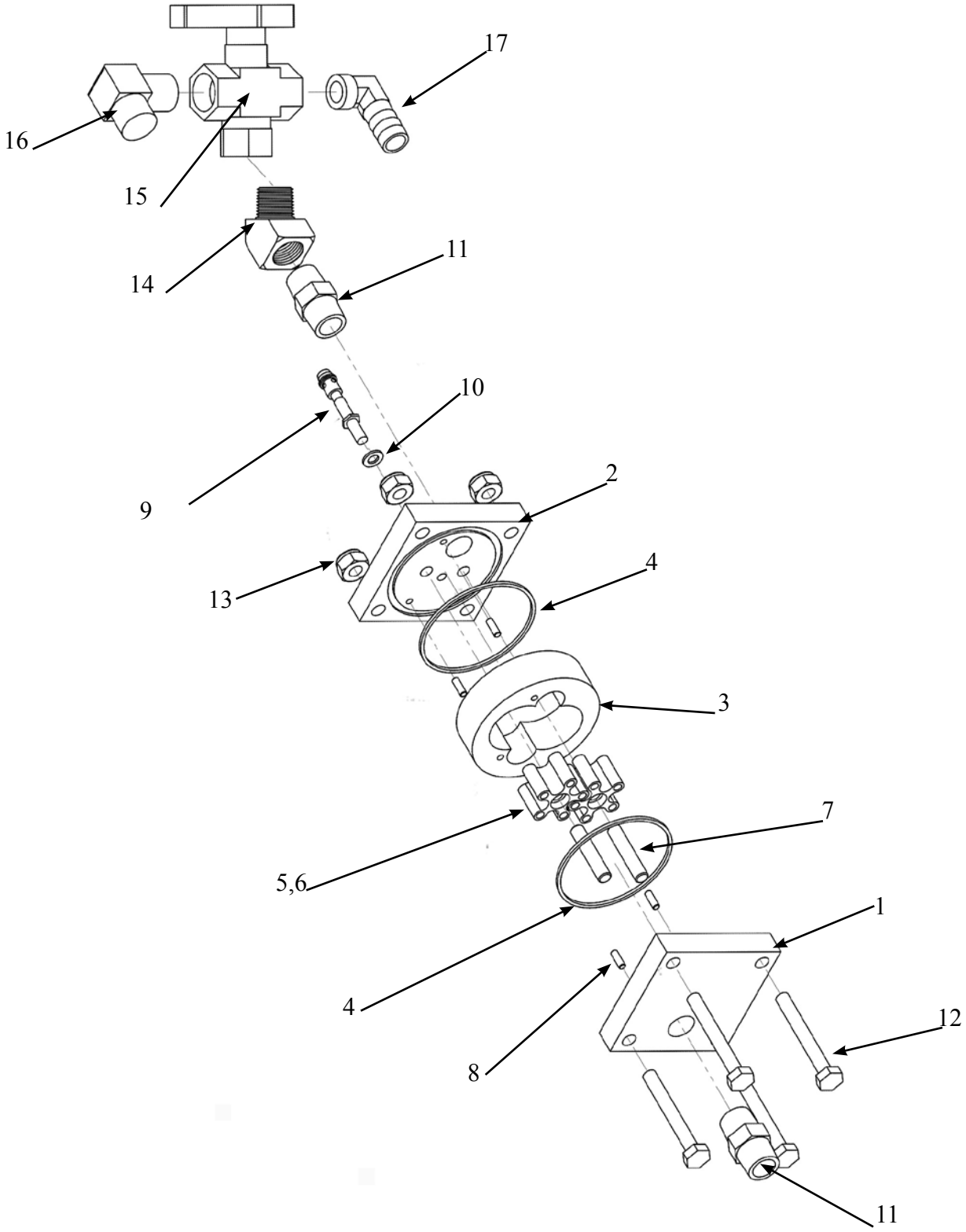




115497 FOAM FLOW METER ASSEMBLY

1.	044-1920-01-0	1	Flowmeter Right Cover
2.	044-1920-00-0	1	Flowmeter Left Cover
3.	062-0910-00-0	1	Flowmeter Housing
4.	040-0340-00-0	2	O-ring 2-034 Buna-N 70 Durometer
5.	016-1010-00-0	2	Flowmeter Rotor
6.	064-6390-00-0	10	Sensor Target for Flowmeter Rotor
7.	064-6680-00-0	2	Dowel Pin Ø0.25” x 1.25” SST
8.	064-6260-01-0	4	Dowel Pin Ø0.13” x 0.38” SST
9.	200-2481-00-0	1	Speed Sensor
10.	097-1971-00-0	1	Sealing Washer #10
11.	082-0364-02-0	2	Hex Adapter 2X 3/8” MNPT
12.	018-1220-12-0	4	Hex Head Bolt 1/4-20 x 2.00” SST
13.	110-1206-02-0	4	Nut Nylock 1/4-20
14.	116964	1	Street Elbow 45° 3/8” NPT
15.	038-2220-00-0	1	Ball Valve 3/8” FNPT 3-way
16.	082-0317-02-0	1	Elbow 90° 3/8” MNPT x 1/2” Tube
17.	082-0327-02-0	1	Elbow 90° 3/8” MNPT x 1/2” Hose Barb

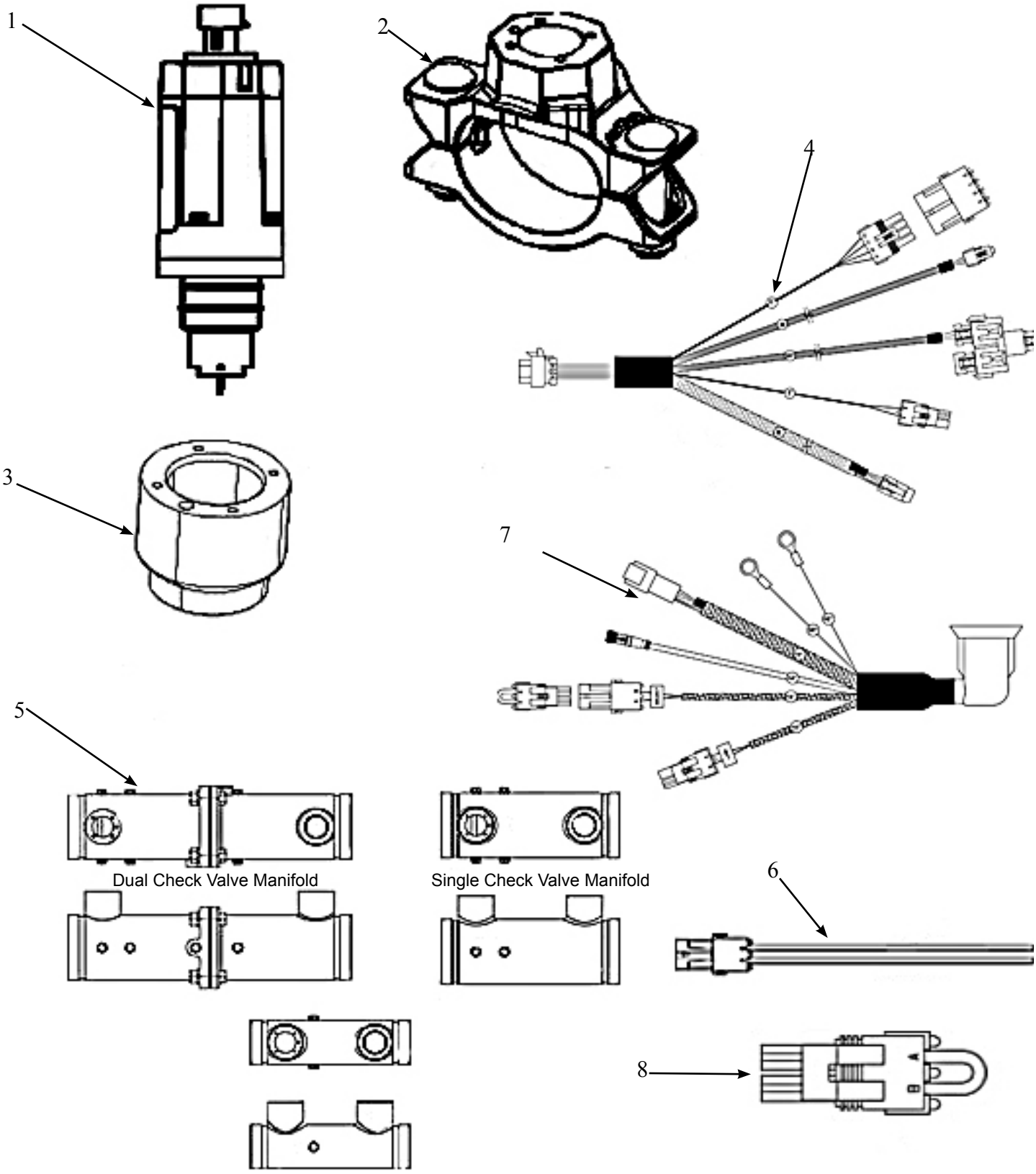
Figure 46: Foam Flow Meter Assembly



FLOW SENSOR COMPONENTS

1. 102714 ..... Paddlewheel Flow Sensor
2. 4842010..... Saddle Clamp 2” with Flowmeter Port
   4843010..... Saddle Clamp 2.5” with Flowmeter Port
   4844010..... Saddle Clamp 3” with Flowmeter Port
   4846010..... Saddle Clamp 4” with Flowmeter Port
   4845010..... Saddle Clamp 5” with Flowmeter Port
3. SFM ..... Weld Fitting for Paddlewheel Flow Sensor - Stainless Steel
   309010..... Weld Fitting for Paddlewheel Flow Sensor - Aluminum
   309020..... Weld Fitting for Paddlewheel Flow Sensor - Steel
4. 113438-A..... FoamLogix Control Head Harness - 10’ x 14”
   113439-B ..... FoamLogix Control Head Harness - 15’ x 19’
5. 108995..... Dual Check Valve Manifold Assembly - 3.0”
   108966..... Single Check Valve Manifold Assembly - 3.0”
   112074 ..... Single Check Valve Manifold Assembly - 2.0”
6. H513-0270-040-D ..... Power Wire Harness
7. 113434-B ..... FoamLogix Distribution Box Harness - Single Tank (Included in base system - 115498)
8. 513-0320-23-0 ..... Tank Select Plug (included in 113434-B Harness)

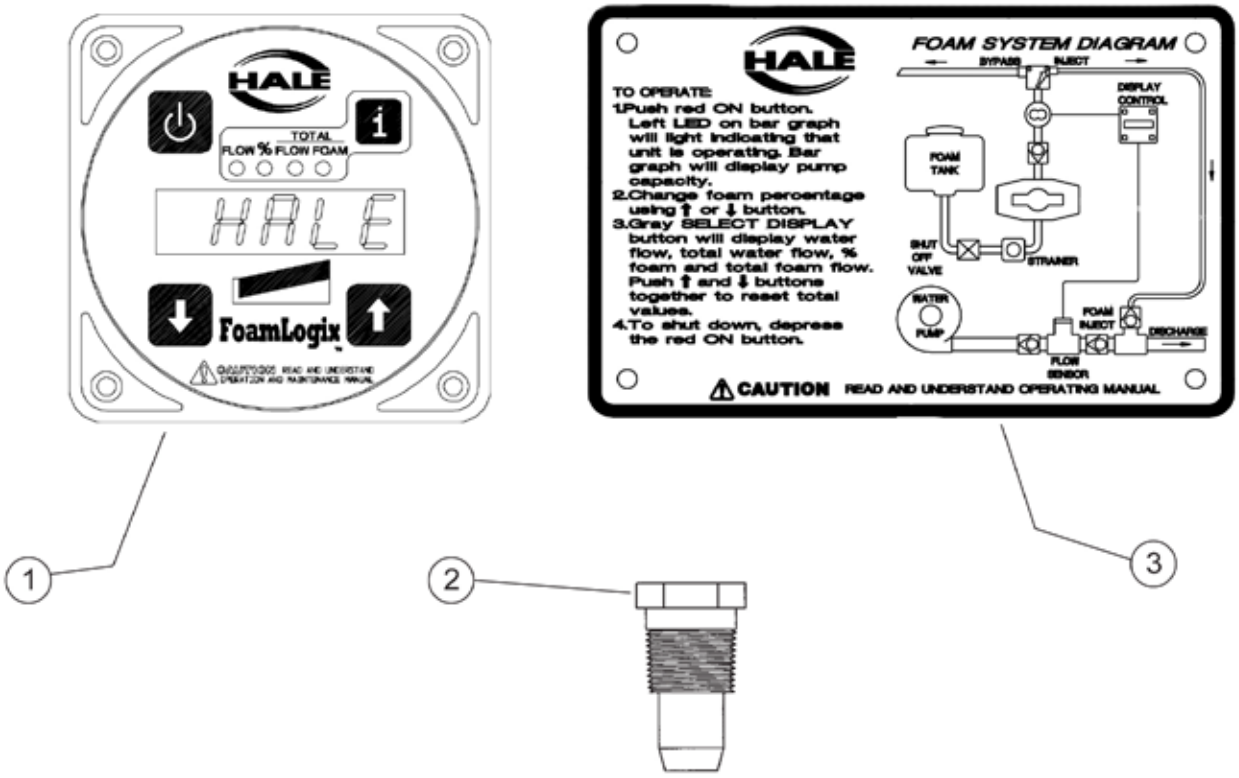
Figure 47: Flow Sensor Components



Additional Foam Logix Components

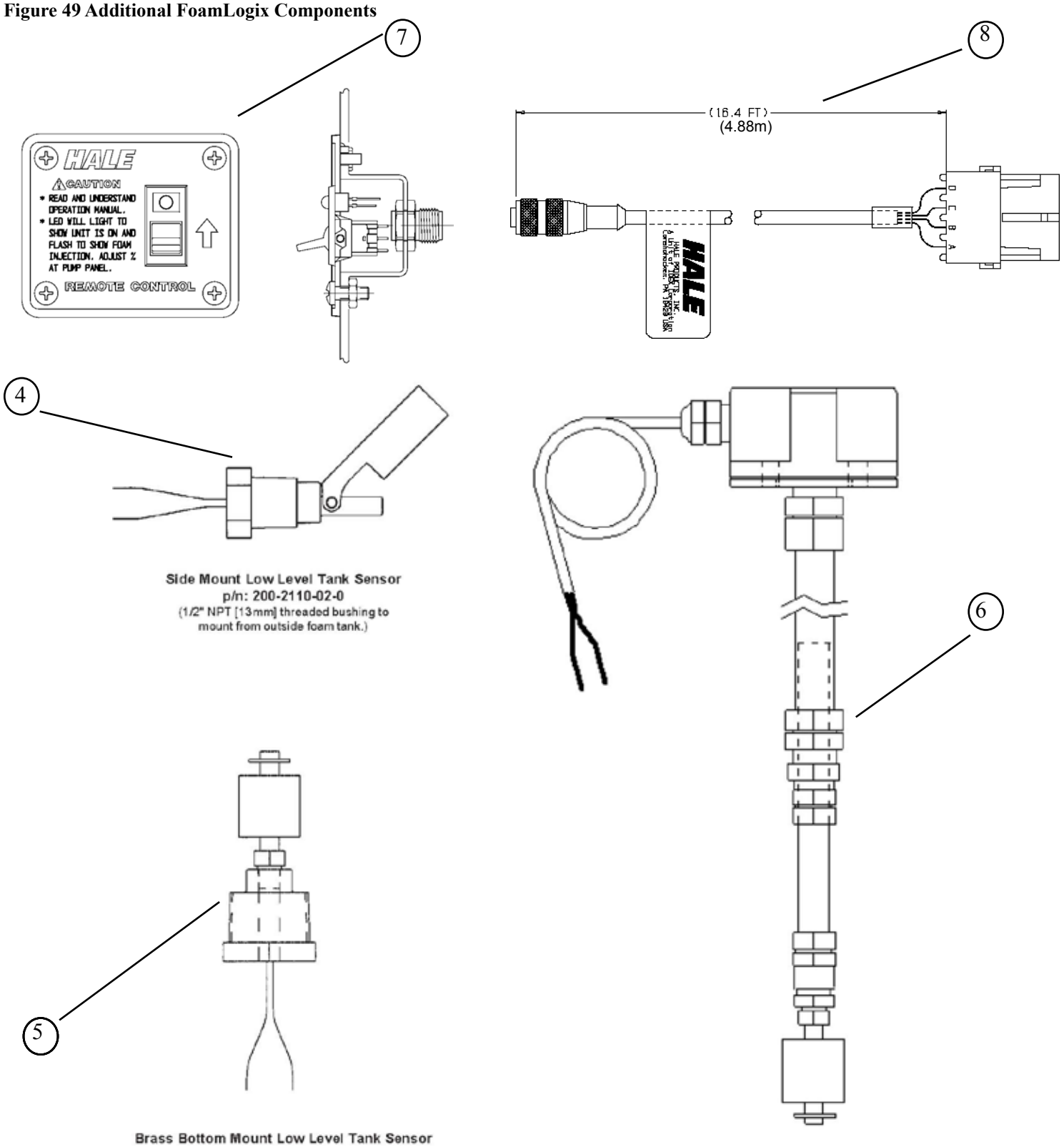
1. 111530 FoamLogix Control Head
2. 038-1790-00-0 Injector Check Valve
3. 101-1630-70-0 FoamLogix Placard
4. 200-2110-02-0 Side Mount Low Level Tank Sensor
5. 200-2110-04-0 Bottom Mount Low Level Tank Sensor
6. 200-2110-06-0 Top Mount Low Level Tank Sensor
7. 513-0330-01-0 Remote Control Switch Assembly
8. 513-0680-00-0 Remote Control Cable - 16’ (4.88m)

Figure 48: Additional FoamLogix Components

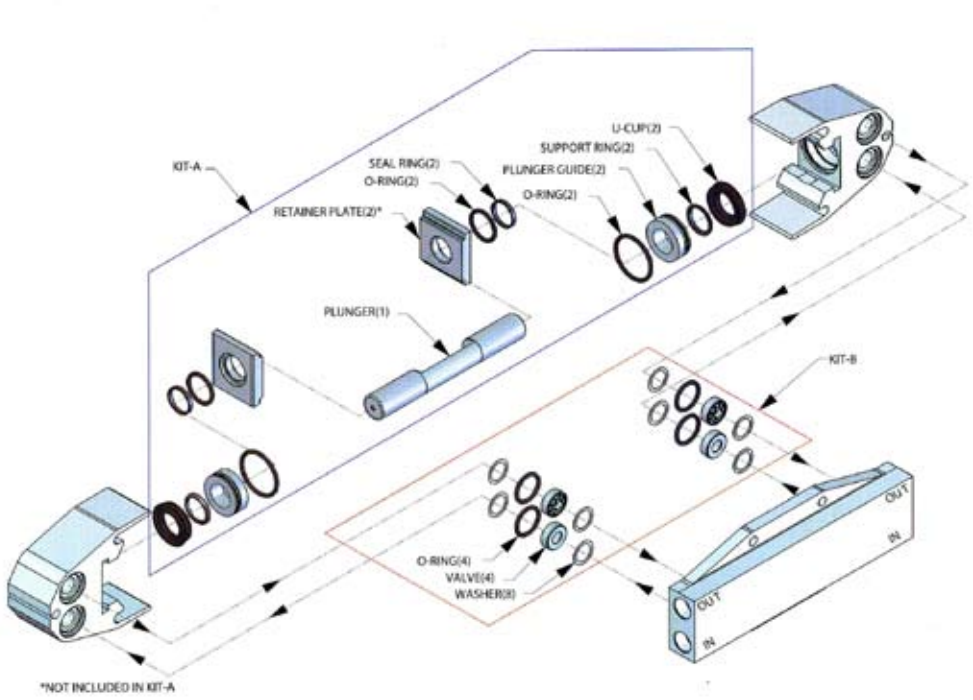


ADDITIONAL FOAMLOGIX COMPONENTS

Figure 49 Additional FoamLogix Components



FoamLogix Pump Repair Kit



Item #	Part Number	Qty.	Description
Kit A.....	117495	1	Plunger and Seals
Kit B	117496	1	Valve and Seals
Kit C	117497.....	1	Cam Bearing

Appendix A Hale Foam Concentrate Compatibility

The following foam concentrates are approved for use in Hale Foam Proportioning Systems.

The Class A foam concentrates are approved for use in all Hale Foam Proportioning systems (Hale FoamLogix 5.0, 3.3, 2.1A and 1.7AHP and Hale V Series.

TYPE OF FOAM CONCENTRATE	MANUFACTURER	NAME
CLASS A fOAM		
US Forestry Service Approved - Reference *&**	Ansul	Silvex Class A Foam Concentrate
	Kidde fire Fighting/Angus Fire	Forexpan S (0.1% - 1.0%)
	Kidde fire Fighting/Angus Fire	Hi Combat Class A (lst Defense Class A cold Water Foam
	Kidde fire Fighting/Angus Fire	Knock-Down
	Monsanto	PhosCheck WD881
	Chemonics	Fire-Trol Fire Foam 103
	Chemonics	Fire-Trol Fire Foam 104
	3M	Light Water FT-1150
	Chemguard	First Class - Class A foam P/N S100-307
	ABC Macintosh Agent	Bio-For N
	Enchem Products Ltd	Enchem 207
* For use in FoamLogix® models 5.0, 3.3, 2.1A , 1.7AHP and Hale V Series ** USFS approved foams have been tested for corrosion and biodegradability toxicity by the US Forest Service in addition to the Hale testing described on the following page.		
Non U.S. forestry Service Approved - Reference *	Chem Guard	Class A Plus
	Unifoam Co. Ltd.	UniA 1%
	3M	Light Water SFFF
	Kidde Fire Fighting/National Foam	Responder
	Kidde Fire Fighting/Angus fire	FirePower Class A
	3M-Australia	Fire Brake Bush Fire Fighting Foam P/N 0295337

Table 50: Hale Foam Concentrate Compatibility

Reference

The preceding foam concentrates have been tested by Hale Products in a Hale FoamLogix® system to ensure compatibility with Hale FoamLogix® models 2.1A, 1.7AHP, 3.3 and 5.0 Foam Proportioning Systems. These Chemicals were ran for several hundred hours over several months under nominal conditions to make sure they do not harm the Foam System. This list is solely intended to assist the end user in selection of foam concentrate(s) compatible with a Hale FoamLogix® Model 5.0 and 3.3 and is not a determination of the fire fighting effectiveness of one product over another.

Always consult with NFPA standards, U.L. Listings, Federal, State, and local regulations, and requirements pertaining to application and environmental regulations before selecting a foam concentrate. Some of the foam chemicals listed may require special hardware considerations. (Refer to FoamLogix® user manual for additional information).

Many Fire Fighting Foam Chemical Manufacturers have specific instructions on handling and use of their products including, but not limited to, shelf life, tank life, temperature limits, and intervals between use. Always follow Manufacturers instructions for use.

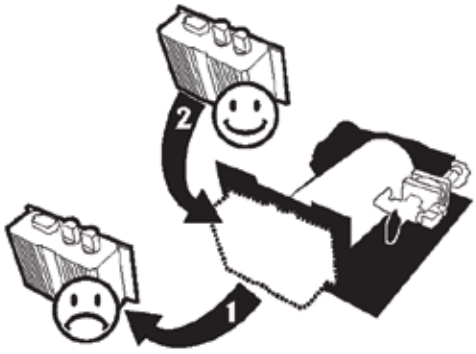
This Appendix applies to Hale Foamlogix® foam pumps built after April 17, 1997. For Hale FoamMaster foam pumps built prior April 17, 1997 refer to Bulletin 650, Rev 2.

If a particular foam concentrate you wish to use does not appear on this list, please contact your Hale representative for information concerning compatibility with Hale FoamLogix® Foam Proportioning System. As further testing is completed, Hale Products Inc. updates this list and expands capabilities and features to keep the Hale FoamLogix® the best system available for all the fires you fight.

FoamLogix 2.1A

DC Motor Driver Installation Check List

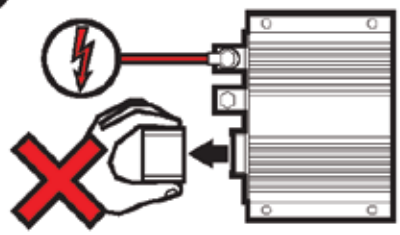
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Please perform the following steps to verify the FoamLogix system integrity after replacing the DC Motor Driver.

Realice por favor los pasos siguientes para verificar la integridad de sistema de FoamLogix después de substituir el DC Motor Driver.

1



Never disconnect when power is applied.

Nunca desconecte cuando la energía es aplicada.

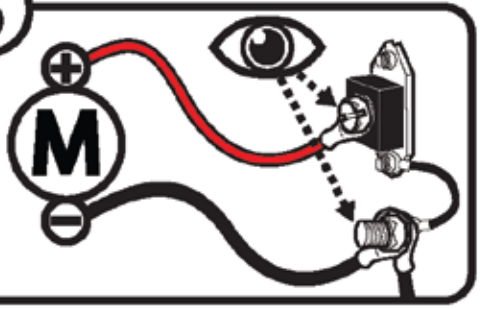
2



Find the location of the suppression diode and the main ground.

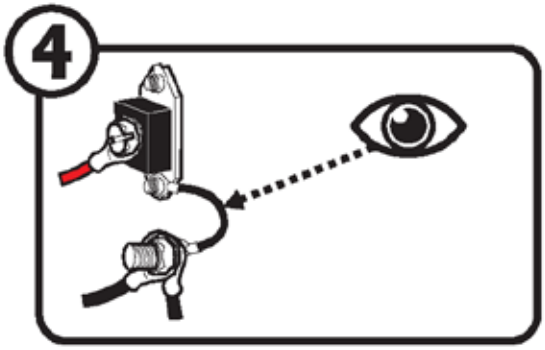
Encuentre la localización del diodo de la supresión y del perno de tierra principal.

3



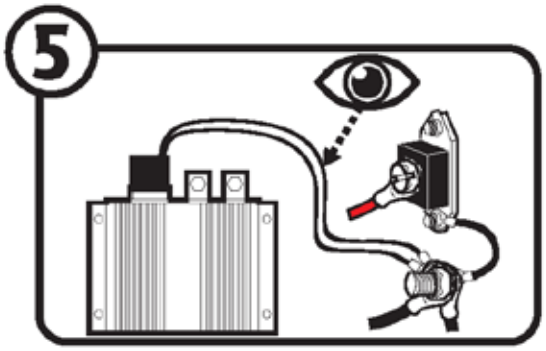
Verify the motor is connected to the diode and main ground.

Verifica el motor esté conectado con el diodo y la tierra principal.



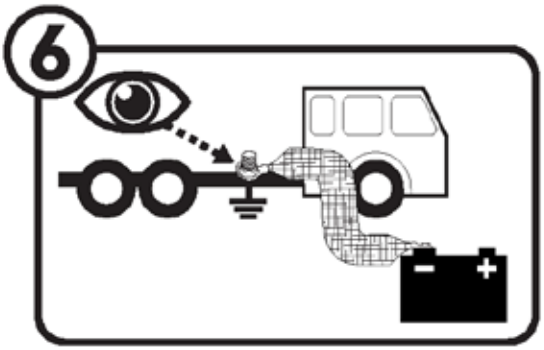
Verify the base of the diode is connected to the main ground.

Verifica la base del diodo esté conectada con la tierra principal.



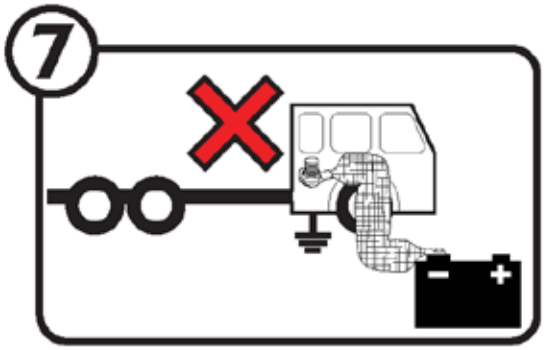
Verify two ground wires from the DC Motor Driver are connected to the main ground.

Verifica dos alambres de tierra del conductor del DC Motor Driver estén conectados con la tierra principal.



Verify the battery negative is connected to the vehicle chassis.

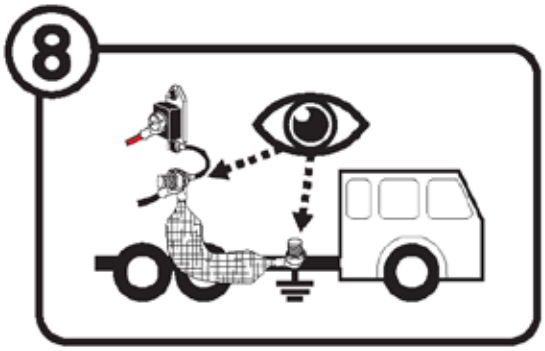
Verifica la negativa de la batería esté conectada con el chasis del vehículo.



Do not use the vehicle body as a grounding point.

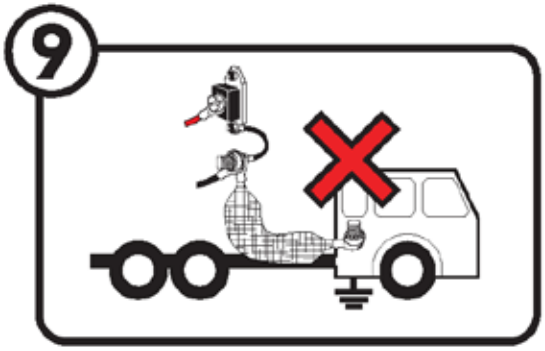
No utilice el cuerpo del vehículo como punto que pone a tierra.

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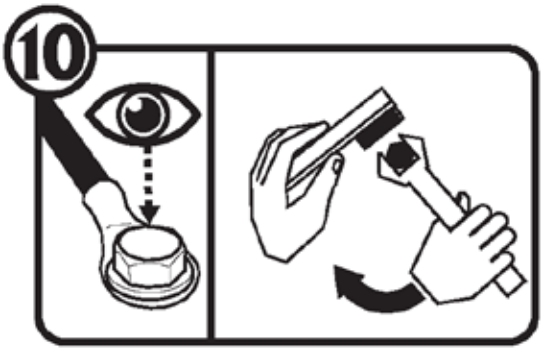
Verify the main ground is connected to the vehicle chassis ground.

Verifica la tierra principal esté conectada con la tierra del chasis del vehículo.



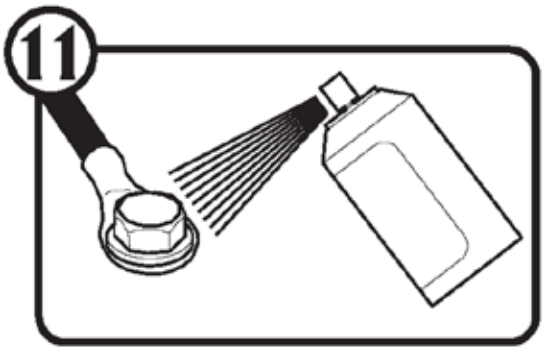
Do not use the vehicle body as a grounding point.

No utilice el cuerpo del vehículo como punto que pone a tierra.



Verify that all electrical connections are tightened and do not have corrosion. Clean and tighten as necessary.

Verifica todas las conexiones eléctricas estén apretadas y no tenga corrosión. Limpie y apriete cuanto sea necesario.

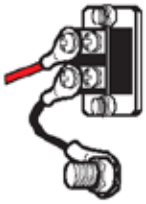


Recommended: Spray all electrical ground and power connections with battery terminal protectant.

Recomendado: Rocíe todas las conexiones eléctricas de la tierra y de energía con el terminal de la batería protectant.

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Note



The diode may be similar to the one shown above.

El diodo puede ser similar a el que está demostrado arriba.



Verify the positive connection is toward the mounting hole.

Verifica la conexión positiva esté hacia el agujero de montaje.

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Foam Flow Sensor Replacement Instructions

1 REPAIR KIT 119348 INCLUDES:

- Foam Flow Sensor (200-2481-00-0)
- Sealing Washer (097-1971-00-0)
- 119376 - Product/Service Bulletin 0017

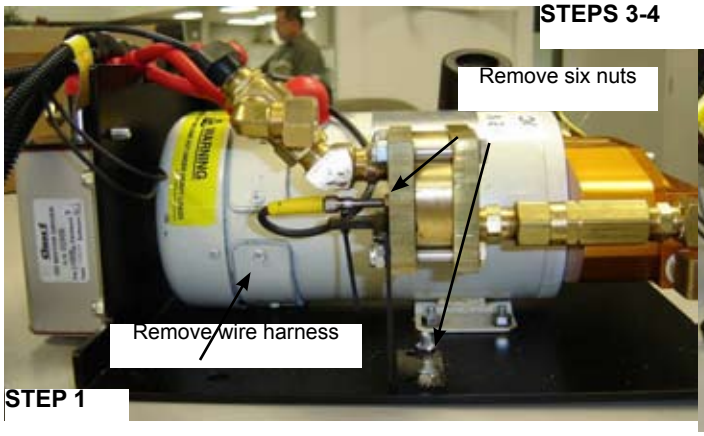
2 REQUIRED TOOLS:

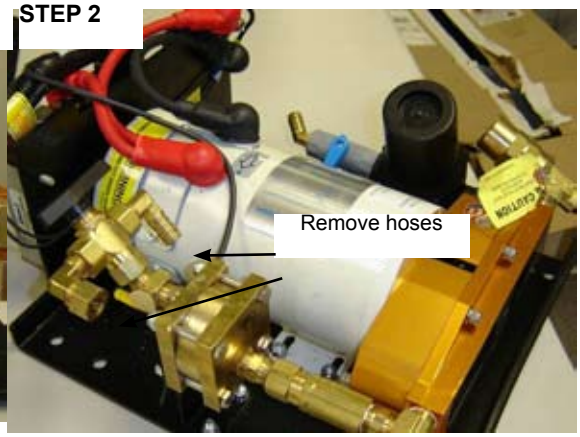
- 7/16” wrench (2X)
- 5/16” wrench

3 SAFETY INFORMATION

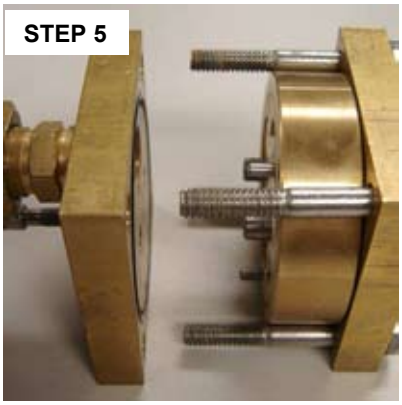
- Remove system power from the FoamLogix system and relieve any trapped pressure.
- Shut off foam tank supply valve.
- Open bypass valve to drain foam lines and use suitable containers to collect residual foam concentrate.
- Protect eyes and skin from foam concentrate per manufacturer’s Material Safety Data Sheet or MSDS.

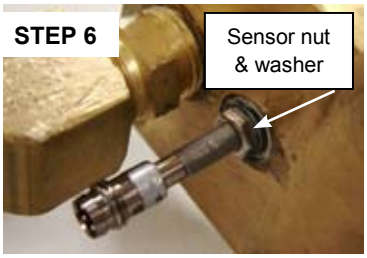
4 REPLACEMENT INSTRUCTIONS

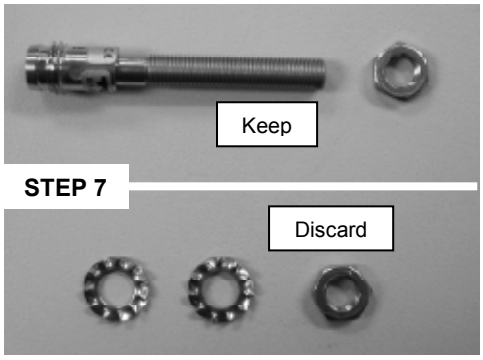


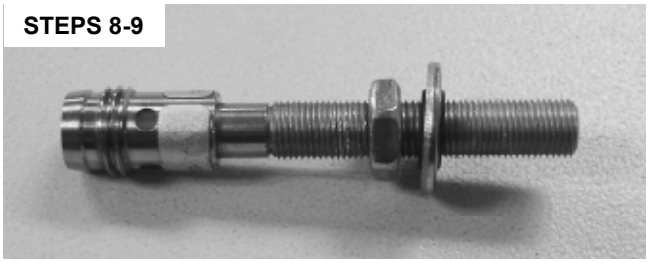


1. Carefully disconnect the wire harness from the old foam flow sensor.
   - Connect the NEW foam flow sensor to the wire harness.
   - Apply system power and verify sensor diagnostic LED is off.
   - Touch end of sensor to brass housing → LED should light.
   - Disconnect the wire harness from the new sensor.
   - Remove system power from the FoamLogix system.
   - (This test verifies that the new sensor is operating correctly.)
2. Disconnect both hoses from the 3-way bypass valve.
3. Remove the four (4) nuts on the brass flowmeter assembly with the two 7/16” wrenches.
4. Remove the two (2) nuts on the bracket bottom with the 7/16” wrench.
5. Remove the sensor side cover of the flowmeter assembly.
   - Inspect o-ring inside the cover for damage or cuts.
6. With the 5/16” wrench, loosen the small retaining nut on the foam flow sensor, and unscrew the sensor by hand.
   - Depending on the return instructions provided by the dealer or manufacturer, it may be necessary to return the old sensor. If not, then the old sensor, nut, and seal washer can be discarded.
7. The foam flow sensor packaging includes two (2) nuts and two (2) lock washers. Only one nut is required for the remaining steps.

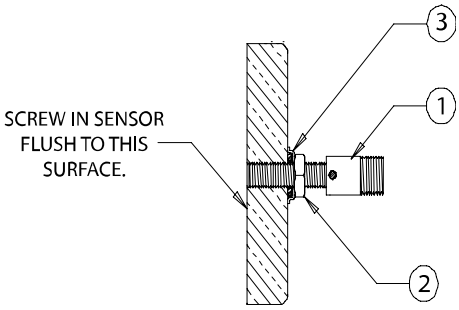








8. Thread the new foam flow sensor nut onto the sensor about 1/2” (12mm).
9. Thread (do NOT push) the new seal washer onto the foam flow sensor about 1/2” (12mm).
   • This seal washer should be silver in color, with a black, rubber seal on the inner diameter.
10. Thread the new foam flow sensor into the brass cover by hand, so that the sensor tip is flush with the inside face of the cover.
    • **DO NOT USE LOCTITE OR THREAD SEALANT ON THE FOAM FLOW SENSOR**.
    • Use a straight edge or flat object to verify the flush position.
    • TIP – When installing the foam flow sensor, it may be easier to lay the brass cover on a flat surface (carefully remove o-ring), and check for flush position after the nut is secure.
11. While holding the new foam flow sensor, lightly tighten the nut with the 5/16” wrench to set the seal washer on the outer face of the brass cover.
12. Verify that the sensor tip is flush with the inner surface and torque the jam nut to a maximum 10.0 in-lb (1.1 N-m).
    • Do not bend or over-tighten the sensor.
    • Use a fine stone to lightly remove any flashing that might stick out after tightening the sensor nut.

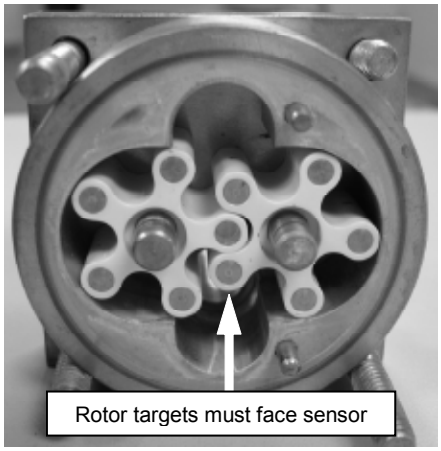


1	200-2481-00-0	FOAM FLOW SENSOR
2	INCLUDED WITH SENSOR	SENSOR NUT
3	097-1971-00-0	SEAL WASHER

13. Remove and inspect the two plastic rotors inside the flowmeter assembly for cracks, burrs, etc.
14. Inspect the inner housing for debris, metal shavings, etc. and remove as necessary.
15. Reinstall both rotors, making sure that each spins freely without binding.

    •When installed, the flush end of the metal targets in the rotors must face out, toward the foam flow sensor.

STEP 15



16. Reinstall the o-ring (if necessary) and reattach the brass cover and the bracket with the six (6) nuts.
    • Tighten all nuts securely and torque to a maximum 6.5 ft-lb (8.5 N-m). Use a criss-cross torque pattern on the four brass housing nuts and bolts.
17. Reattach foam lines and foam flow sensor harness.
18. Apply system power to the FoamLogix system and recalibrate the system per the user manual instructions.

Express Warranty

EXPRESS WARRANTY: Hale Products, Inc ("Hale") hereby warrants to the original buyer that products manufactured by it are free of defects in material and workmanship for one (1) year. The "Warranty Period" commences on the date the original buyer takes delivery of the product from the manufacturer.

LIMITATIONS: HALE'S obligation is expressly conditioned on the Product being:

- Subjected to normal use and service.
- Properly maintained in accordance with HALE'S Instruction Manual as to recommended services and procedures.
- Not damaged due to abuse, misuse, negligence or accidental causes.
- Not altered, modified, serviced (non-routine) or repaired other than by a Hale approved service facility.
- Manufactured per design and specifications submitted by the original Buyer.

THE ABOVE EXPRESS LIMITED WARRANTY IS EXCLUSIVE. NO OTHER EXPRESS WARRANTIES ARE MADE. SPECIFICALLY EXCLUDED ARE ANY IMPLIED WARRANTIES INCLUDED, WITHOUT LIMITATIONS, THE IMPLIED WARRANTIES OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE OR USE; QUALITY; COURSE OF DEALING; USAGE OF TRADE; OR PATENT INFRINGEMENT FOR A PRODUCT MANUFACTURED TO ORIGINAL BUYER'S DESIGN AND SPECIFICATIONS.

EXCLUSIVE REMEDIES: If the Buyer promptly notifies HALE upon discovery of any such defect (within the Warranty Period), the following terms shall apply:

- Any notice to HALE must be in writing, identifying the Product (or component) claimed defective and circumstances surrounding its failure.
- HALE reserves the right to physically inspect the Product and require Buyer to return same to HALE's plant or other authorized service provider.
- In such event, Buyer must notify HALE for a Returned Goods Authorization ("RGA") number and Buyer must return the Product F.O.B. to HALE.
- If determined defective, HALE shall, at its option, repair or replace the Product, or refund the purchase price (less allowance for depreciation).
- Absent proper notice within the warranty Period, HALE shall have no further liability or obligation to Buyer therefore.

THE REMEDIES PROVIDED ARE THE SOLE AND EXCLUSIVE REMEDIES AVAILABLE. IN NO EVENT SHALL HALE BE LIABLE FOR INCIDENTAL OR COSEQUENTIAL DAMAGE(S) INCLUDING, WITHOUT LIMITATIONS, LOSS OF LIFE; PERSONAL INJURY; DAMAGE TO REAL OR PERSONAL PROPERTY DUE TO WATER OR FIRE; TRADE OR OTHER COMMERICAL LOSSES ARISING, DIRECTLY OR INDIRECTLY, OUT OF PRODUCT FAILURE.



Hale Products, Incorporated
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Telephone: 352-629-5020 FAX: 800-533-3569

GODIVA LTD.
Charles Street • Warwick, England CV34 5LR
Phone: 44-1-926-623600

IDEX DINGLEE TECHNOLOGY (Tianjin) Co. Ltd.
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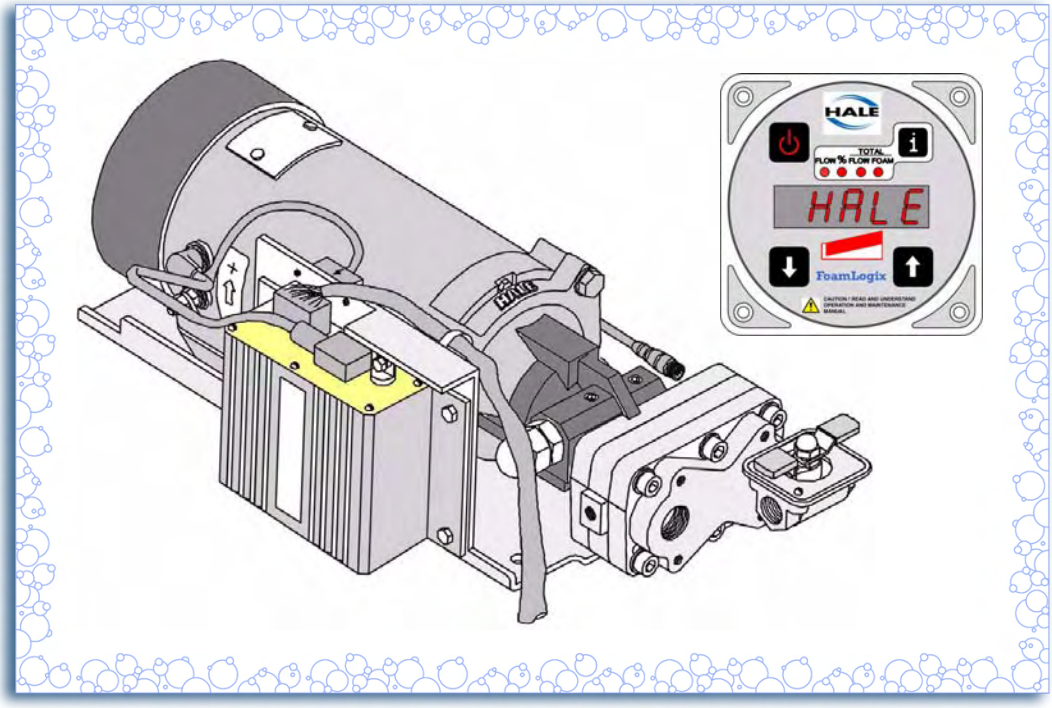


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FoamLogix™

Models 3.3 / 5.0 / 6.5 Electronic Foam Proportioning System

Installation and Operations Manual



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HALE PRODUCTS INC. ISO 9001 Certificate A4026

Manual p/n: 029-0021-68-0

APPARATUS INFORMATION

ENGINE _____

TRANSMISSION _____

MAXIMUM CAFS ENGINE RPM _____

CAFS ENGINE SPEED RANGE _____



NOTICE !

Class1 cannot assume responsibility for product failure resulting from improper maintenance or operation. Class1 is responsible only to the limits stated in the product warranty. Product specifications contained in this manual are subject to change without notice.

All Class1 products are quality components -- ruggedly designed, accurately machined, precision inspected, carefully assembled and thoroughly tested. In order to maintain the high quality of your unit, and to keep it in a ready condition, it is important to follow the instructions on care and operation. Proper use and good preventive maintenance will lengthen the life of your unit.

ALWAYS INCLUDE THE UNIT SERIAL NUMBER IN YOUR CORRESPONDENCE.

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How to use this manual

This manual is divided into eight (8) sections for clarity and ease of use. Each of the following sections can be stand alone or used in conjunction with each other.

1 SAFETY

This section must be carefully read, understood and adhered to strictly by all installer/builders, operators and service personnel using the Hale FoamLogix, **Models 3.3, 5.0 and 6.5**, Electronic Foam Proportioning System. Do not use or install the system until you have thoroughly read this section. Failure to comply could cause serious injury to yourself and others, or damage to the system.

2 INTRODUCTION

System overview provides an introduction to the Hale FoamLogix Proportioning System along with guidelines for designing and ordering a complete system.

3 INSTALLATION

This section offers installer/builder installation procedures, plumbing overview diagrams, electrical installation and startup and delivery check lists, to assist the OEM with installation and initial setup of Hale FoamLogix Proportioning System on an apparatus.

4 USER CALIBRATION

User calibration is used by the installer and the end user for start-up and calibration of the Hale FoamLogix Proportioning System to produce the proper foam flow.

5 OPERATION

The Operation section primarily used by the apparatus user for proper operation and maintenance of the Hale FoamLogix Proportioning System. It is a guide to the operation of the system and includes operating procedures for the most commonly used options.

6 GENERAL MAINTENANCE

This section describes the routine inspection and maintenance requirements for the Hale FoamLogix System.

7 TROUBLESHOOTING

If a problem develops, see this section for troubleshooting procedures.

8 PARTS IDENTIFICATION

Section 8 includes a parts breakdown of the most commonly used parts of the FoamLogix 3.3, 5.0 and 6.5 Systems. Also see Section 8, Parts Identification and Drawing Package, heading “Illustrated Parts Breakdown” on page 157.

9 PLATE DRAWINGS

Section 9 includes a listing of required installation and parts identification drawings for the FoamLogix 3.3, 5.0 and 6.5 Systems. Also see Section Parts Identification and Drawing Package, heading “9 Plate Drawings” on page 170.

1 Safety Precautions



IMPORTANT !

THE HALE "**FOAMLOGIX™" MODELS 3.3, 5.0 and 6.5 ELECTRONIC FOAM PROPORTIONING SYSTEMS** ARE DESIGNED FOR OPTIMUM SAFETY OF ITS OPERATORS AND TO PROVIDE RELIABLE AND SAFE FOAM CONCENTRATE INJECTION. FOR ADDED PROTECTION AND BEFORE ATTEMPTING INSTALLATION OR OPERATION PLEASE FOLLOW THE SAFETY GUIDELINES LISTED IN THIS SECTION. ADHERE TO ALL WARNING, DANGER, CAUTION AND IMPORTANT NOTES FOUND WITHIN THIS GUIDE.

THIS SECTION ON SAFETY MUST BE CAREFULLY READ, UNDERSTOOD AND ADHERED TO STRICTLY BY ALL INSTALLERS AND SYSTEM OPERATORS BEFORE ATTEMPTING TO INSTALL OR OPERATE THE FOAMLOGIX FOAM PROPORTIONING SYSTEM.

WHEN DEVELOPING DEPARTMENTAL APPARATUS OPERATING PROCEDURES, INCORPORATE THE WARNINGS AND CAUTIONS AS WRITTEN.

FoamLogix is a trademark of Hale Products, Incorporated. All other brand and product names are the trademarks of their respective holders.

1.1 DEFINITIONS



DANGER !

DANGER – Immediate hazard which WILL result in severe personal injury or death if the warning is ignored.



WARNING !

WARNING – Hazards or unsafe practices which COULD result in severe personal injury or death if the warning is ignored.



CAUTION !

CAUTION – Hazards or unsafe practices which COULD result in minor or moderate personal injury if the warning is ignored.

NOTICE !

NOTICE – Practices which could result in damage to the apparatus or other property.

1.2 GUIDELINES

READ ALL INSTRUCTIONS THOROUGHLY BEFORE BEGINNING ANY INSTALLATION OR OPERATION PROCESS.

- ❑ Installation should be performed by a trained and qualified installer, or your authorized Hale Products Service Representative.
- ❑ Be sure the installer has sufficient knowledge, experience and the proper tools before attempting any installation.
- ❑ Make sure proper personal protective equipment is used when operating or servicing the apparatus.
- ❑ A foam tank low level sensor must be utilized to protect the Hale foam proportioner from dry running. *Failure to use a low level sensor with the Hale Foam System voids warranty.*
- ❑ DO NOT permanently remove or alter any guard or insulating devices, or attempt to operate the system when these guards are removed.

  Make sure all access/service panels and covers are installed, closed and latched tight, where applicable.
- ❑ DO NOT remove or alter any hydraulic or pneumatic connections, electrical devices, etc. DO NOT tamper with or disconnect safety features or modify protective guards (such as covers or doors). DO NOT add or remove structural parts. *Doing so voids the warranty.*

  Any of the above could affect system capacity and/or safe operation of the system and is a serious safety violation which could cause personal injury, could weaken the construction of the system or could affect safe operation of the FoamLogix Proportioning System.

WARNING !

NO MODIFICATIONS OR ADDITIONS MAY BE MADE TO THE FOAMLOGIX PROPORTIONING SYSTEM WITHOUT PRIOR WRITTEN PERMISSION FROM:

Hale Products, Incorporated

Fire Suppression Division

700 Spring Mill Avenue

Conshohocken, PA 19428

Telephone: 610-825-6300

Fax: 610-825-6440

- ❑ To prevent electrical shock always disconnect the primary power source before attempting to service any part of the Hale FoamLogix System.
- ❑ All electrical systems have the potential to cause sparks during service. Take care to eliminate explosive or hazardous environments during service and/or repair.
- ❑ To prevent system damage or electrical shock the main power supply wire is the last connection made to the Hale Foam Proportioner Distribution Box.
- ❑ Release all pressure then drain all concentrate and water from the system before servicing any of its component parts.
- ❑ Do not operate the system at pressures higher than the maximum rated pressure.
- ❑ Use only pipe, hose, and fittings from the foam pump outlet to the injector fitting, which are rated at or above the maximum pressure rating at which the water pump system operates.
- ❑ Hale Foam proportioning systems are designed for use on negative ground direct current electrical systems only.
- ❑ Do not mount radio transmitters or transmitter cables in direct or close contact with the FoamLogix Control Unit.
- ❑ Before connecting the cord sets and wiring harnesses, inspect the seal washer in the female connector.

  If the seal washer is missing or damaged, water can enter the connector causing corrosion. This could resulting in possible system failure.
- ❑ Always disconnect the power cable, ground straps, electrical wires and control cables from the control unit or other Hale Foam system equipment before electric arc welding at any point on the apparatus

  Failure to do so could result in a power surge through the unit that could cause irreparable damage.
- ❑ DO NOT connect the main power lead to small leads that are supplying some other device, such as a light bar or siren.

  The Hale FoamLogix, Models 3.3, 5.0 and 6.5, require 60 AMP minimum current.
- ❑ When operating the Hale FoamLogix in Simulated Flow Mode, an outlet for the foam concentrate must be provided to prevent excessive pressure buildup in the discharge piping or hoses.

- ❑ Unless engaged in Class “B” foam operations, the air dual tank (ADT) toggle switch, or the manual dual tank (MDT) II selector handle must be in the TANK “A” or FLUSH position. If either is in the FLUSH position when the foam system is started, the foam pump runs for approximately twenty (20) seconds, then SHUTS DOWN.
- ❑ Make sure the foam tank and foam concentrate suction hoses are clean before making final connections to the foam pump. If necessary flush the tank and hoses prior to making connection.
- ❑ Check all hoses for weak or worn conditions after each use. Ensure that all connections and fittings are tight and secure.
- ❑ Ensure that the electrical source of power for the unit is a negative (–) ground DC system, of correct input voltage, with a reserve minimum current available to drive the system.
- ❑ The in-line strainer/valve assembly is a low pressure device and CANNOT withstand flushing water pressure in excess of 45 PSI (3 BAR).

  When installing the in-line strainer in systems equipped with the Hale MDT II or MST, make sure the in-line strainer/valve assembly is installed on the “inlet” side of the valve.

  If the strainer is subjected to flushing water, install Hale FS Series strainers.
- ❑ When determining the location of the Hale FoamLogix System components keep in mind piping runs, cable routing and other interferences that could hinder or interfere with proper system performance.
- ❑ Always position the check valve/injector fitting at a horizontal or higher angle to allow water to drain away from the fitting. This avoids the possibility of sediment deposits or the formation of an ice plug.
- ❑ The cord sets provided with each Hale Foam system are 100% electrically shielded assemblies.

  NEVER attempt to shorten or lengthen the molded cables. If necessary, order longer or shorter cord sets to suit your application needs.
- ❑ Each cord sets provided is indexed to ensure correct receptacle installation (they insert one way only).

  When making cord set connections DO NOT force mismatched connections as damage can result in improper system operation.
- ❑ Make sure all connections are sound, and that each connection is correct.
- ❑ The cables shipped with each Hale Foam system are 100% tested at the factory with the unit. Improper handling and forcing connections can damage these cables which could result in other system damage.

- ❑ There are no user serviceable parts inside Hale Foam system electrical/ electronic components.

  Opening the distribution box, control unit, foam multiplexing display unit, etc., voids the warranty.

- ❑ Use mounting hardware that is compatible with all foam concentrates to be used in the system. Use washers, lock washers and cap screws made of brass or 300 series stainless steel.
- ❑ When making wire splice connections, make sure they are properly insulated and sealed using an adhesive filled heat shrink tubing.
- ❑ ALWAYS connect the primary positive power lead from the terminal block to the master switch terminal or the positive (+) battery terminal.

  Use a minimum 4 AWG type SGX (SAE J1127) chemical resistant battery cable and protect with wire loom.
- ❑ Prevent corrosion of power and ground connections by sealing these connections with the silicone sealant provided.
- ❑ Prevent possible short circuit by using the rubber boot provided to insulate the primary power connection at the Hale FoamLogix Distribution Box.

Notes

1 System Overview

The Hale FoamLogix **Models 3.3, 5.0 and 6.5** Foam Proportioning Systems are completely engineered, factory matched foam proportioning systems that provide reliable, consistent foam concentrate injection for Class “A” and Class “B” foam operations.

Hale FoamLogix Foam Systems accurately deliver from 0.1% to 10.0% foam concentrate through a check valve/injector fitting, directly into the water discharge stream. It is then fed as foam solution into a standard fog nozzle, an air aspirated nozzle, or CAFS equipment, through the apparatus discharge piping. A properly configured and installed foam system with Hale recommended components virtually eliminates contamination of the booster tank, fire pump and relief valve with foam concentrate.

2.1 ROTARY GEAR PUMP

The heart of the Hale FoamLogix 3.3, 5.0 and 6.5 systems is an electric motor driven rotary gear pump. The pump is constructed of bronze and stainless steel and is compatible with almost all foam concentrates. The pump is close coupled to the electric motor thereby eliminating maintenance of an oil-filled gearbox. A relief valve mounted on the foam pump and constructed of stainless steel, protects the foam pump and foam concentrate discharge hoses from over pressurization and damage.

2.2 CONTROL UNIT

The control unit, mounted on the operator panel, is the single control point for the FoamLogix system. Pressing the ON button starts foam concentrate injection. A super bright digital LED display shows the:

- ❑ Water flow rate
- ❑ Total water flow
- ❑ Foam concentrate injection percentage
- ❑ Total foam concentrate used, depending on the display mode selected

A bar graph indicates the approximate system capacity being used. Adjustment of the foam concentrate injection rate is accomplished by pressing the appropriate button while the system is operating.

The control unit display also warns the operator if errors or abnormal operations occur in the system, such as low foam level.

2.3 WATER FLOW SENSOR

The foam concentrate injection rate is controlled by a computer chip in the control unit for accurate, repeatable, reliable foam concentrate injection. A water flow sensor constantly monitors water flow through the discharge piping. The information from the flow sensor is provided to the control unit by a shielded cable. When the FoamLogix system is activated at the control unit a signal is sent through the control cable to the distribution box to begin foam concentrate injection. The distribution box then provides power to the electric motor. As the motor rotates the pump, foam concentrate flows through the foam pump discharge to the one piece check valve/injector fitting into the water discharge stream.

Note: All Hale FoamLogix Foam systems require a flow sensor for operation.

2.4 FEED BACK SENSOR

Injection Rate (Percent %)	Maximum Foam Solution Flows					
	Model 3.3		Model 5.0		Model 6.5	
	GPM	LPM	GPM	LPM	GPM	LPM
0.1	3,300	12,492	5,000	18,927	Not Applicable	
0.2	Not	6,245	2,500	9,464		
0.3	1,100	4,164	1,667	6,310		
0.5	660	2,498	1,000	3,785	1,300	4,921
1.0	330	1,249	500	1,893	650	2,461
3.0	110	416	167	632	216	818
6.0	55	208	83	314	108	409

Table 2-1: Maximum Foam Solution Flows

A feedback sensor in the foam pump discharge measures foam concentrate flow. The water flow rate and foam concentrate flow rate are constantly compared by the computer chip in the control unit.

The motor speed is constantly adjusted to maintain the operator selected foam concentrate injection rate. Since the system is flow based, injection rate remains constant regardless of changes in system pressure or the number of discharges that are open (within the limits of the system).

There are three models of Hale Foam systems covered by this manual. The Hale FoamLogix Model 3.3 (3.3GPM / 12.5LPM), Model 5.0 (5.0GPM / 19LPM) and Model 6.5 (6.5GPM / 24.6LPM).

The maximum rated foam concentrate flow in gallons per minute is denoted by the model number. Table 2-1: “Maximum Foam Solution Flows” on page 20 shows the system capacities at various foam concentrate injection rates for each Hale FoamLogix Model.

The Hale FoamLogix 3.3, 5.0 and 6.5 system configuration is shown in Figure 2-2: “Foam Pump Installation Envelope Dimensions“ on page 25. Also see Figure 2-3: “Foam Pump Installation Envelope Dimensions, ADT Option Only” on page 26.

2.5 TANK SELECTOR VALVES

Selection of the desired foam concentrate tank with the **ADT** panel mounted toggle switch or **MDT II** selector automatically changes the foam concentrate injection rate to the preset default rate for the selected foam tank. No further operator intervention is required.

The **ADT**, **MDT II** and **MST** include the check valves and connection points to provide foam pump flushing capabilities.

Air Dual Tank Selector (ADT)

The Air Dual Tank (ADT) valve is an air operated foam tank selector valve that enables selection of foam concentrate dependent on fire ground operational demands.

The ADT is an integral part of the foam pump and provides an electrical interlock for the low tank level sensors and concentrate injection rate. A panel mounted selector toggle switch with indicator lights controls foam concentrate tank selection and shows which foam concentrate tank is in use.

Manual Dual Tank Selector (MDT II)

The Manual Dual Tank (MDT II) selector valve is available for the Hale Foam systems with dual tanks. The MDT II is a panel mounted, manually operated selector that provides selection of foam concentrate dependent on fire ground operational demands.

The MDT II also provides an electrical interlock for the low tank level sensors and concentrate injection rate. The MDT II is not suitable for top mount operator panel installations and some side operator panels due to gravity feed requirements of foam concentrate to the foam pump.

Manual Single Tank (MST)

Single tank foam systems can be configured with a Manual Single Tank (MST) selector, which provides a flush function connection to the foam system electronic controls.

2.6 LOW PRESSURE STRAINER

A low pressure foam concentrate strainer is mounted at the inlet of the foam pump. The strainer protects the pump from debris that might accumulate in the foam concentrate tank. The strainer and valve assembly has a composite nonmetallic housing with stainless steel mesh strainer element and includes a service shut-off valve and mounting bracket.

The assembly uses a 1-1/4" (32mm) NPT thread and is supplied with fittings for connection of either 1-1/4" (32mm) ID, 1" (25mm) ID or 3/4" (19mm) ID foam concentrate suction hose. The in-line strainer and valve assembly is suitable for use with both Class "A" and Class "B" foam concentrates and is designed for installations where the strainer is mounted in the foam pump suction line.

The strainer and valve are low pressure devices and are designed for installations where the strainer **IS NOT** subject to HIGH pressure flushing water.

Hale FS Series Strainers

Hale **FS** series strainers (FS15 and FS25) are panel mounted with a 500 PSIG (34 BAR) pressure rating, suitable for use where flushing water pressure must pass through the strainer.

The **FS15** strainer uses 3/4" (19mm) NPT connection ports and a 1-1/2" NST cap. It is suitable for use with Class "A" and *low viscosity* Class "B" foam concentrates.

The **FS25** strainer uses 1" (25mm) NPT connection ports and a 2-1/2" NST cap. It is suitable for use with both Class "A" and Class "B" foam concentrates.

2.7 ORDERING INFORMATION

Use the current Hale FoamLogix Foam System Price List and Order Form to help ensure a complete matched system is provided to the end user.

Use the following procedure when ordering a Hale FoamLogix Foam System. Follow all steps to ensure that a complete system is ordered:

1. Check Hale Foam system product information update (Bulletin #961) for the latest information and advice for foam system selection. A copy of Bulletin #961 is located at the back of this manual.

2. Determine the type of foam concentrate being used in the system and ensure system compatibility by referring to the Hale Foam Concentrate Compatibility Chart. Also see Heading "Appendix A: Foam Concentrate Compatibility" on page 149.

3. Determine the Hale Foam system needed.

   - ❑ Model 6.5 (24VDC motor only)
   - ❑ **Model 5.0**
   - ❑ Model 3.3
   - ❑ **12 VDC**
   - ❑ 24 VDC motor

4. Determine tank selector needed based on the number of foam concentrate tanks installed.

   - ❑ **ADT**..... for dual tank systems
   - ❑ MDT II ..... for dual tank systems (not available for model 6.5)
   - ❑ MST ..... for single tank systems
   - ❑ No Select .. for single tank systems –

     System installer/builder must provide flushing water connection to the foam pump.

5. Determine strainers needed.

   - ❑ **In-line Strainer and Valve Assembly**
   - ❑ FS 15 Strainer
   - ❑ FS 25 Strainer

6. Determine the low tank level sensors needed.

   - ❑ **Side Mount**
   - ❑ Bottom Mount
   - ❑ Top Mount Assembly

7. Select the **flow sensor**, then the mounting weld fitting or saddle clamp based on discharge pipe size.

8. Select harness length.

   - ❑ **10 feet flow sensor x 15 feet controller**
   - ❑ 15 feet flow sensor x 20 feet controller

9. Additional Hale components available to enhance system operation and ease installation include:

   - ❑ Waterway Check Valves
   - ❑ Manifolds
   - ❑ Flanges
   - ❑ Foam Tanks, etc.

10. Components shown in **bold** type represent the best value performance system. All components listed have been engineered and tested with Hale foam systems to provide optimum system performance. Using the information provided and the detailed ordering procedures on the option order form ensures a complete Hale foam system is ordered, thus eliminating delays caused by missing components.

11. System components are shown in the following heading “Hale Foam System Specifications.”

2.8 HALE FOAM SYSTEM SPECIFICATIONS

(See Figure 2-2: “Foam Pump Installation Envelope Dimensions,” on page 25.) Also see Figure 2-3: “Foam Pump Installation Envelope Dimensions, ADT Option Only” on page 26.

Foam Pump ..... Rotary Gear Positive Displacement

Rated Foam Concentrate Output

Model 3.3 .....3.3 GPM (13 LPM)

Model 5.0 .....5.0 GPM (19 LPM)

Rated Foam Concentrate Output - continued

Model 6.5 ..... 6.5 GPM (25 LPM)

Maximum System Operating Pressure

Model 3.3 ..... 350 PSI (24 BAR)
Model 5.0 ..... 200 PSI (14 BAR)
Model 6.5 ..... 200 PSI (14 BAR)

Maximum Operating Temperature ..... 160° F (71° C)

Pump Motor

Standard - Models 3.3 and 5.0 ..... 3/4 HP (0.6 kW), 12 VDC
Standard - Model 6.5 ..... 1-1/4 HP (0.9 kW), 24 VDC
Optional ..... 3/4 HP (0.6 kW), 24 VDC

Operating Ampere Draw ..... 30 AMPS at 12 VDC (15 AMPS at 24 VDC)

Maximum Ampere Draw ..... 60 AMPS at 12 VDC (30 AMPS at 24 VDC)

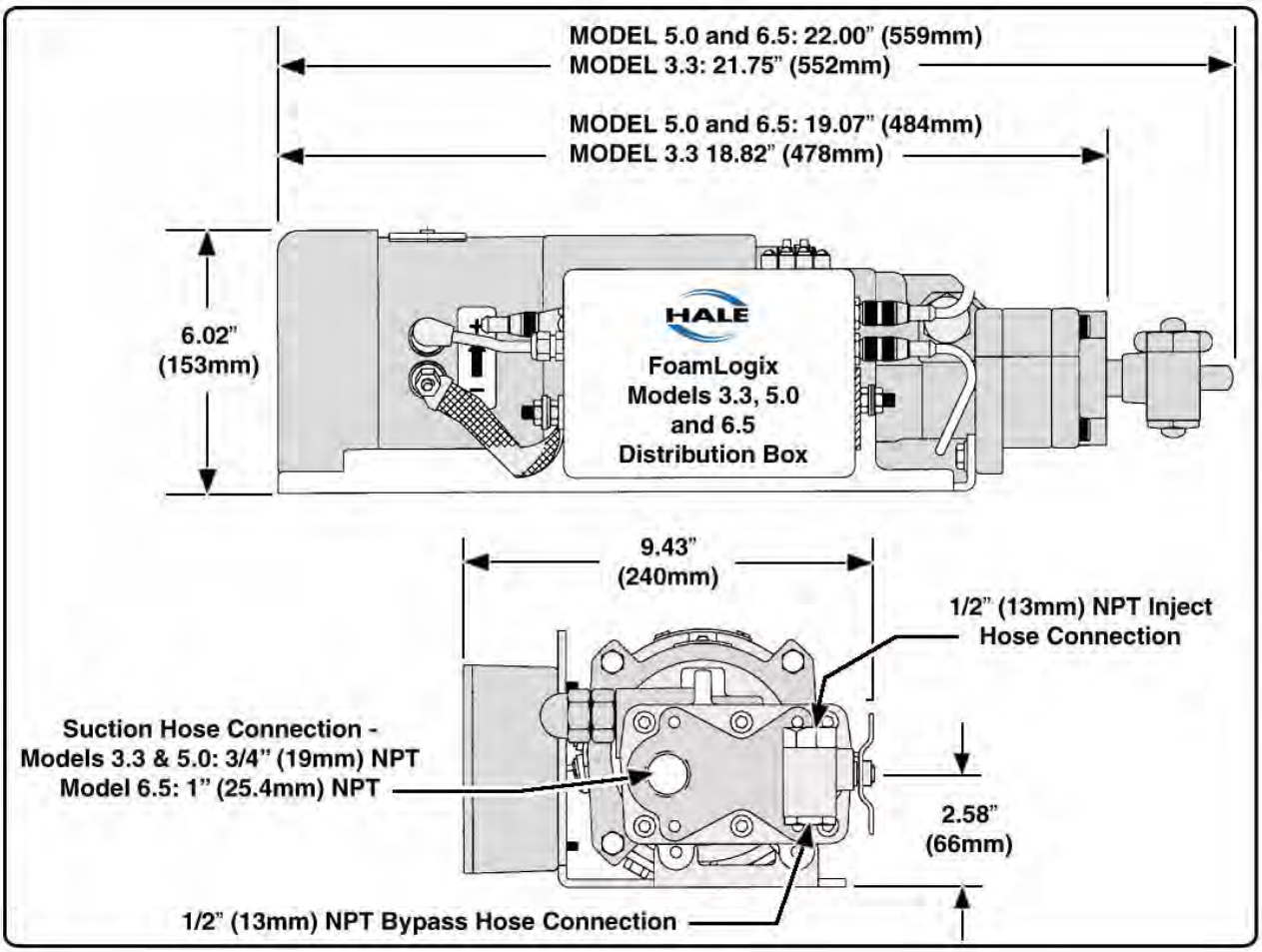


Figure 2-2: Foam Pump Installation Envelope Dimensions

(Configured for use with MDT II, MST or No Tank Selection Options.)

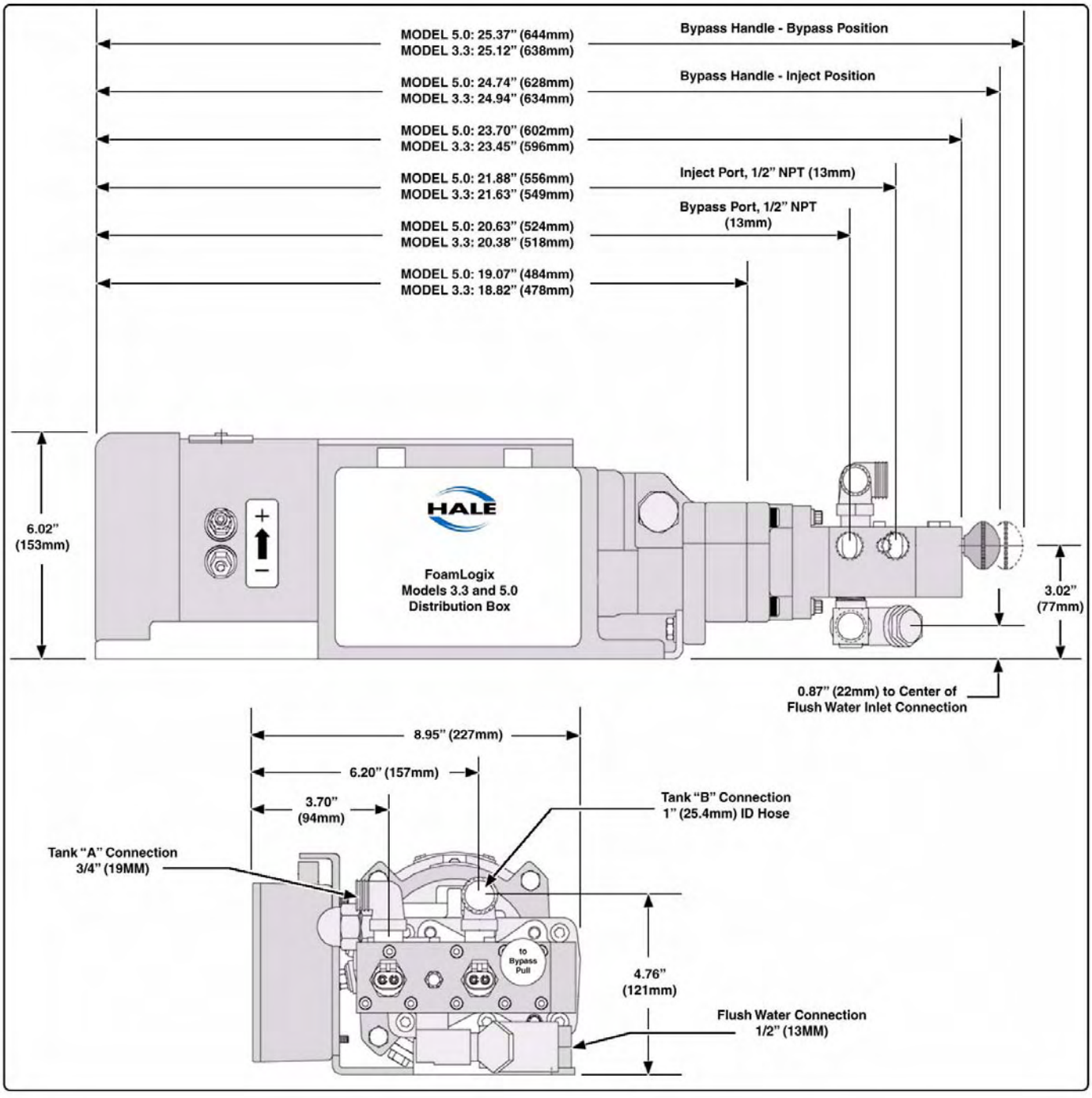
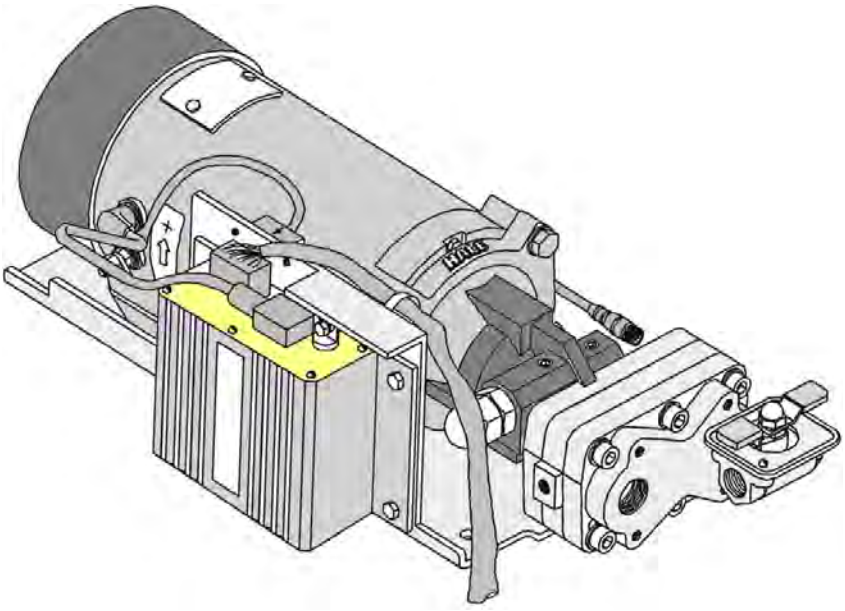


Figure 2-3: Foam Pump Installation Envelope Dimensions, ADT Option Only

2.9 SYSTEM CONFIGURATION

Hale Foam Proportioner System, Models 3.3, 5.0 or 6.5

All Hale Foam systems include a: Foam Pump/Motor Assembly, Control Unit, Main Harness and Check Valve/Injector Fitting. Also see Section 8 “Illustrated Parts Breakdown” on page 157.



Foam Pump/Motor Assembly
(Shown with Bypass Valve when configured for MDT II, MST or No Tank Selector Option)



Control Unit
p/n: 111530



Check Valve/Injector Fitting
p/n: 038-1790-00-0

FoamLogix Model	Part Number
Model 6.5, with 24VDC Motor	501-4480-04-0
Model 5.0, with 12VDC Motor	501-3130-04-0
Model 5.0 with 24VDC Motor	501-3130-03-0
Model 3.3 with 12VDC Motor	501-3120-03-0
Model 3.3 with 24VDC Motor	501-3120-04-0

Figure 2-4: FoamLogix Available Models

Figure 2-5: Hale Foam Proportioner Systems, Models 3.3, 5.0 and 6.5

2.10 CABLE HARNESS

For cable harness overviews, see Section " 9 Plate Drawings," beginning on page 170. Also see Figure 2-6: "Power Connection Wire Harness" on page 28.

p/n: 113436 ...Control Head Harness, 10' x 4' (3.1 x 1.2 m)
10' - Flow Sensor x 4' - Motor Control

p/n: 113438 ...Control Head Harness, 10' x 14' (3.1 x 4.3 m)
10' - Flow Sensor x 14' - Motor Control

p/n: 113439 ...Control Head Harness, 15' x 19' (4.6 x 5.8 m)
15' - Flow Sensor x 19' - Motor Control

p/n: 113437 ...Control Head Harness, 32" x 5.5' (0.81 x 1.7 m)
32" - Flow Sensor x 5.5' - Motor Control

p/n: 113434 ...Single Tank Moto Control

p/n: 113435 ...Dual Tank Motor Control

p/n: 113437 ...Control Head Harness, 32" x 5.5' (0.81 x 1.7 m)
32" - Flow Sensor x 5.5' - Motor Control

p/n: 113437 ...Control Head Harness, 32" x 5.5' (0.81 x 1.7 m)
32" - Flow Sensor x 5.5' - Motor Control

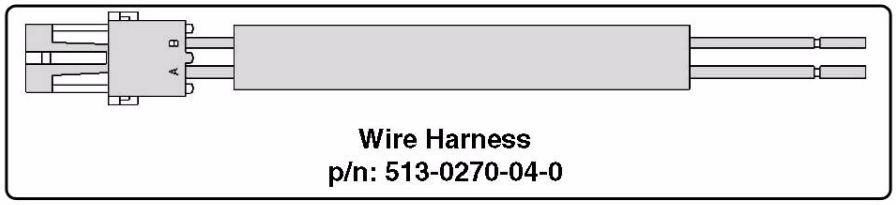


Figure 2-6: Power Connection Wire Harness

2.11 DUAL FOAM CONCENTRATE TANK SYSTEM OPTIONS

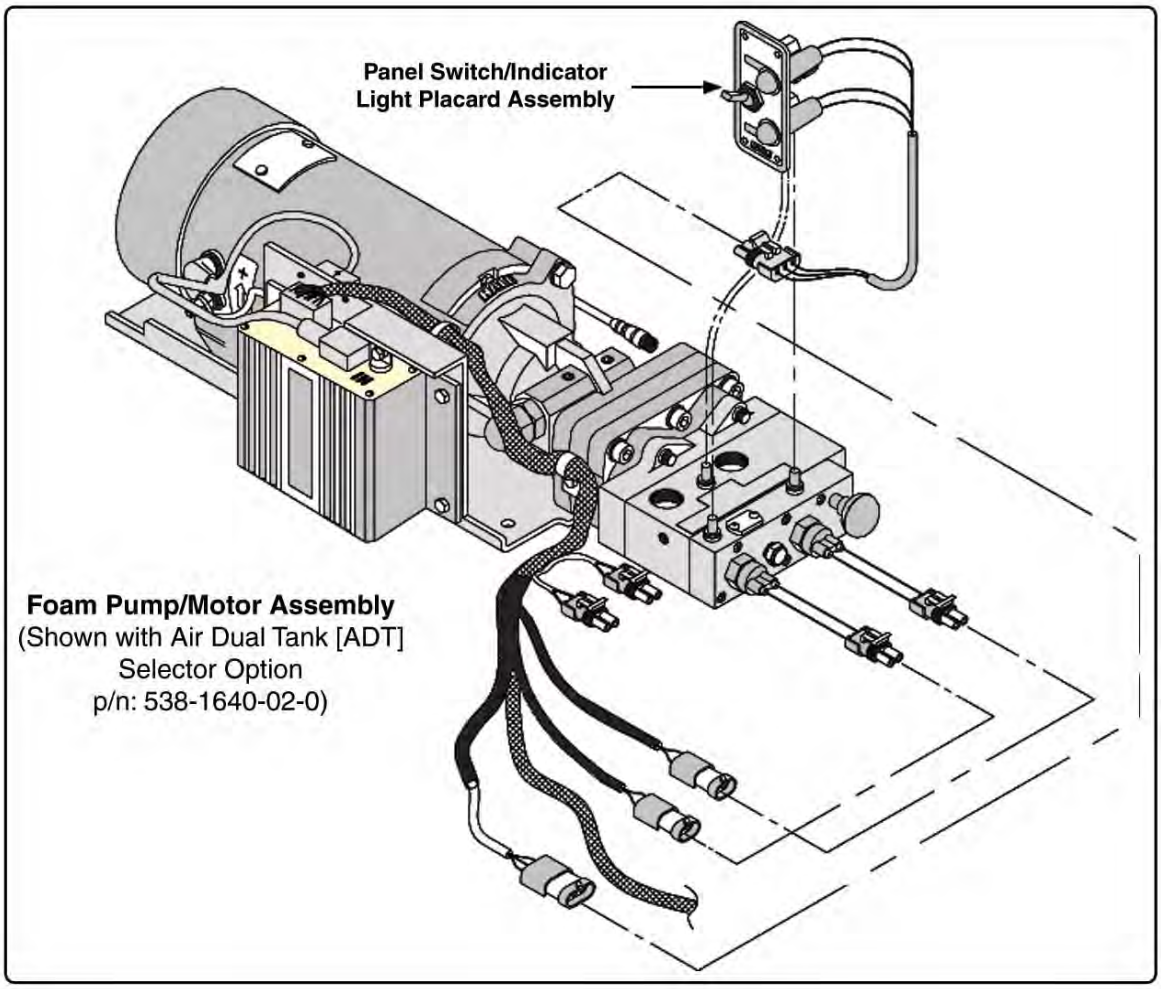
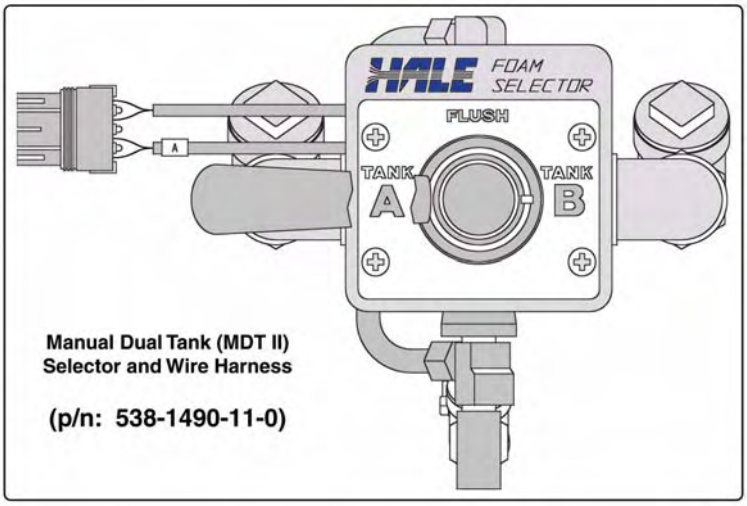


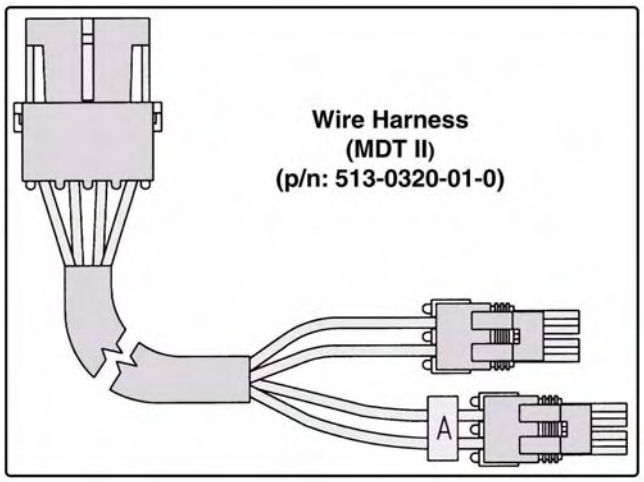
Figure 2-7: Dual Tank Foam Concentrate Tank System Options

2.12 DUAL FOAM CONCENTRATE TANK OPTIONS

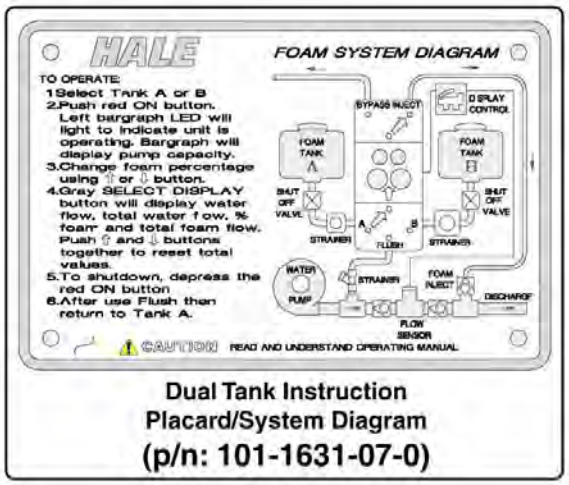


Manual Dual Tank (MDT II)
Selector and Wire Harness

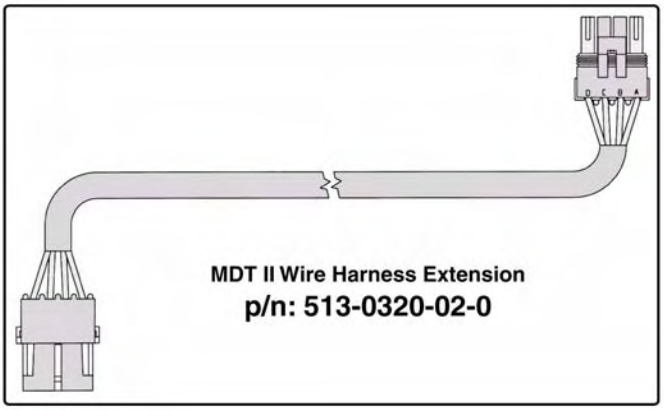
(p/n: 538-1490-11-0)



Wire Harness
(MDT II)
(p/n: 513-0320-01-0)

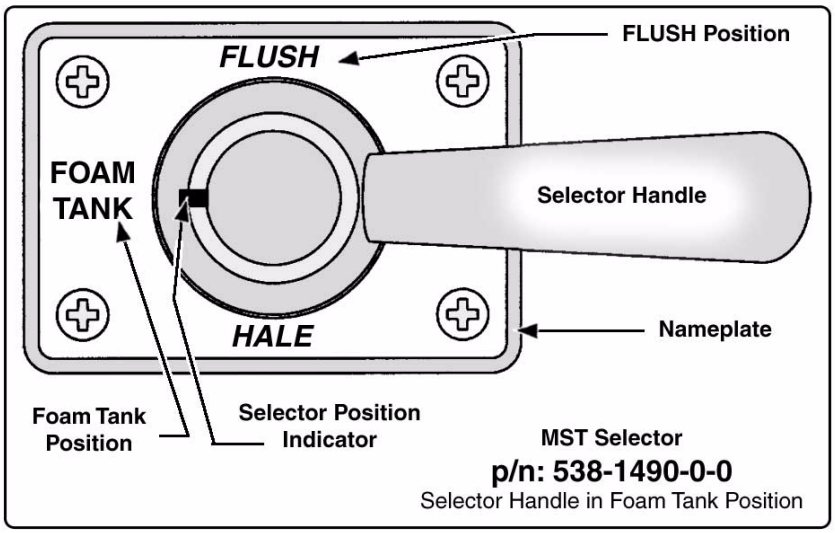


Dual Tank Instruction
Placard/System Diagram
(p/n: 101-1631-07-0)

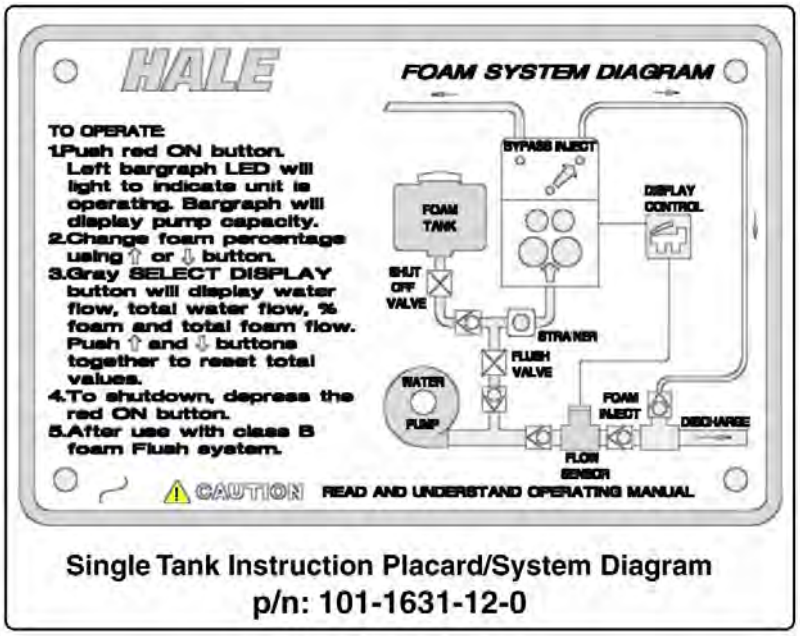


MDT II Wire Harness Extension
p/n: 513-0320-02-0

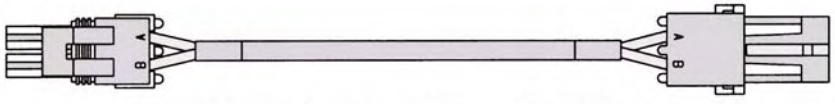
2.13 SINGLE FOAM CONCENTRATE TANK OPTIONS



MST Selector
p/n: 538-1490-0-0
Selector Handle in Foam Tank Position

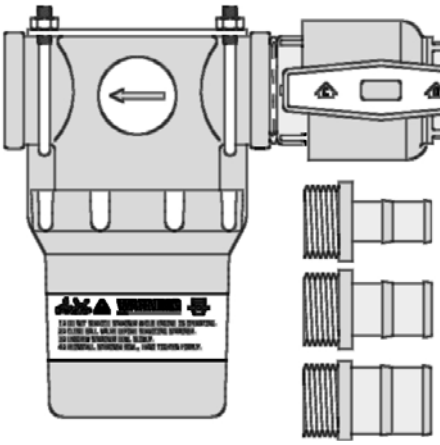


Single Tank Instruction Placard/System Diagram
p/n: 101-1631-12-0



MST Wiring Harness Extension 72" (1.9m)
p/n: 513-0320-17-0

2.14 STRAINER OPTIONS



Also see Figure 3-14: "In-Line Strainer/Valve Installation" on page 67.

In-Line Strainer/Valve Assembly
p/n: 510-0190-01-0

(DO NO USE if Subject to Flushing Water Pressure!)

Note: *For Hale FS Series Strainers, use when Strainer is subjected to flushing water pressure.*



FS-15 Strainer
p/n: 510-0150-00-0

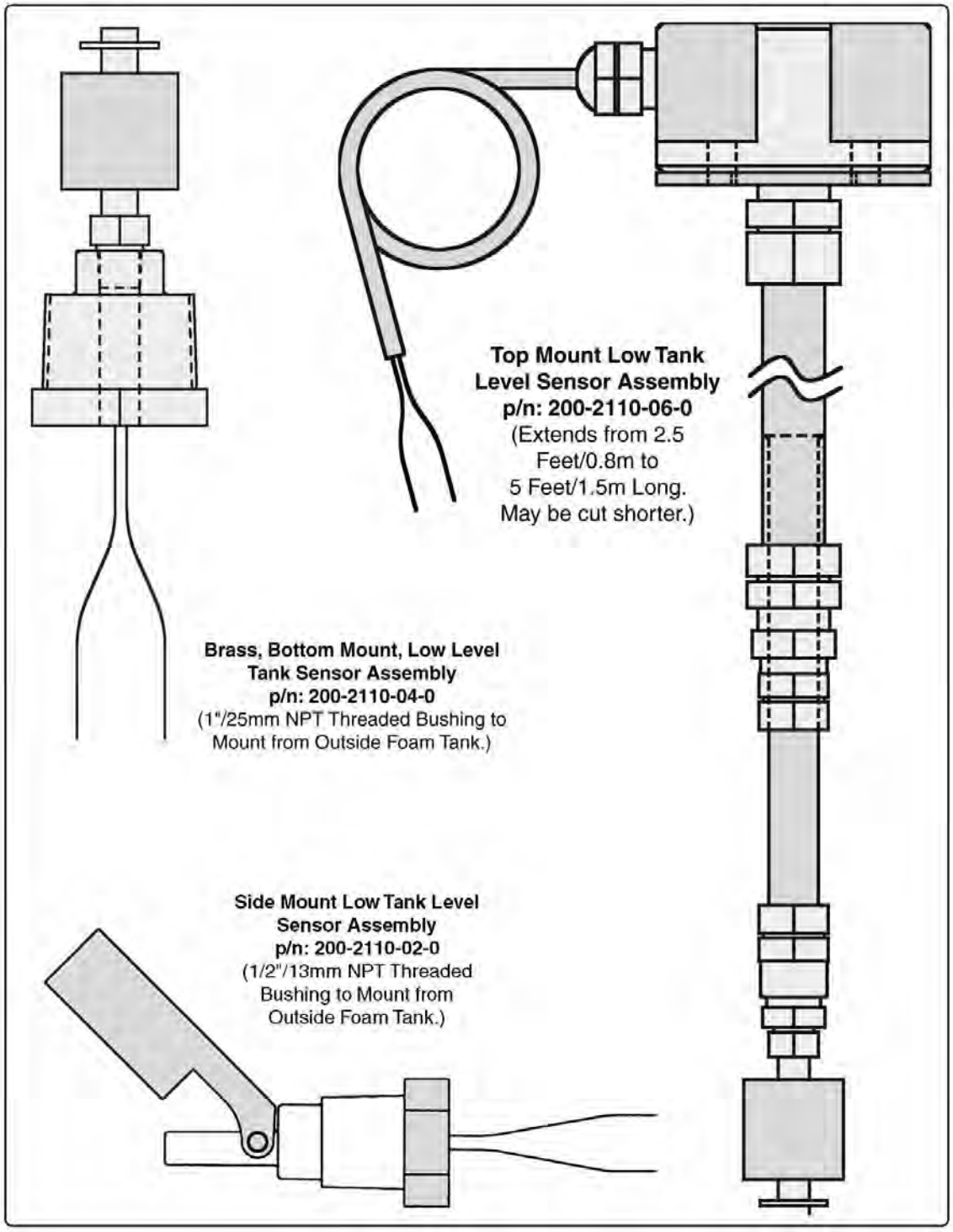
(3/4" / 19mm NPT Threads. Use with Class "A" and thin Class "B" Foam Concentrates)



FS-25 Strainer
p/n: 510-0180-00-0

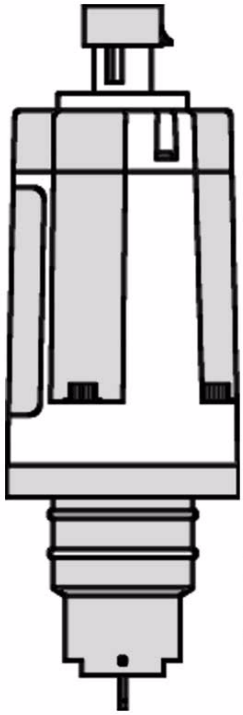
(1"/25.4mm Threads. Use with Class "A" and Class "B" Foam Concentrate)

2.15 LOW TANK LEVEL SENSOR OPTIONS



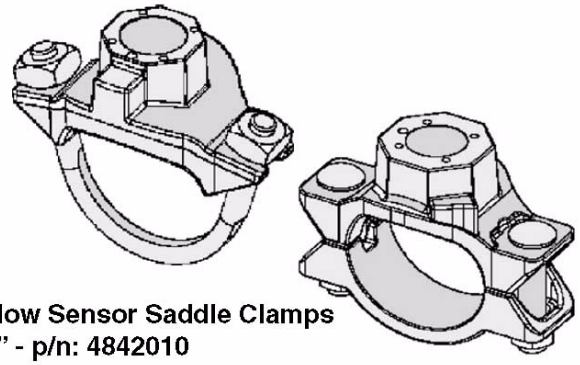
2.16 FLOW SENSORS

Each Hale foam system requires a flow sensor to operate. Pipe size must be selected based on the minimum and maximum water flow in the foam capable discharge. Following is a list of pipe size and rated flow ranges along with flow sensor saddle clamp part numbers. In all instances a weld fitting may be substituted for the saddle clamp.

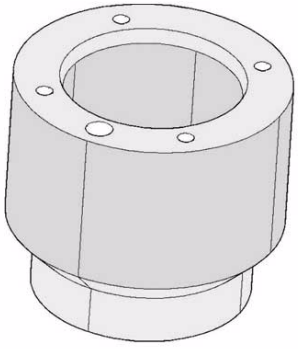


Flow Sensor
Paddle Wheel
p/n: 102714

Pipe Size	Flow Range	
	GPM	LPM
1½" (38mm)	10 - 330	38 - 1,249
2" (50mm)	20 - 550	76 - 2,082
2½" (64mm)	30 - 800	114 - 3,028
3" (76mm)	50 - 1,250	189 - 4,732
4" (102mm)	75 - 1,800	284 - 6,814
SCV or DCV	30 - 750	114 - 2,839



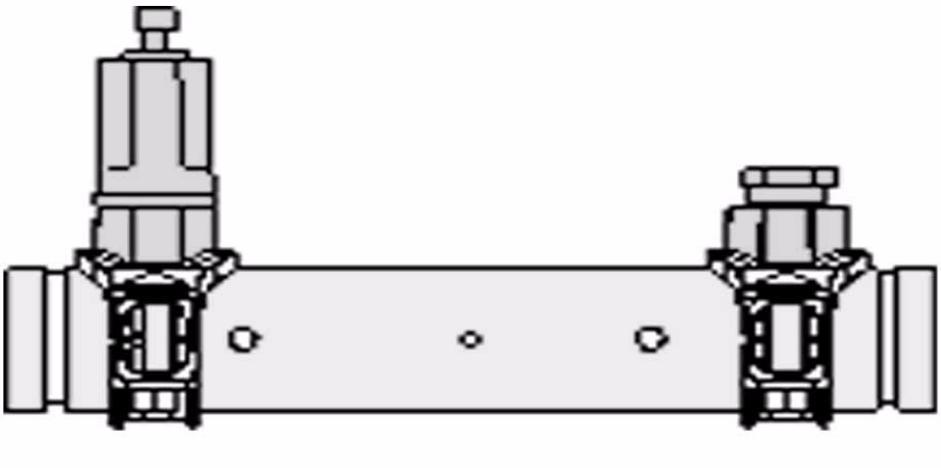
Flow Sensor Saddle Clamps
2" - p/n: 4842010
2-1/2" - p/n: 4843010
3" - p/n: 4844010
4" - p/n: 4846010



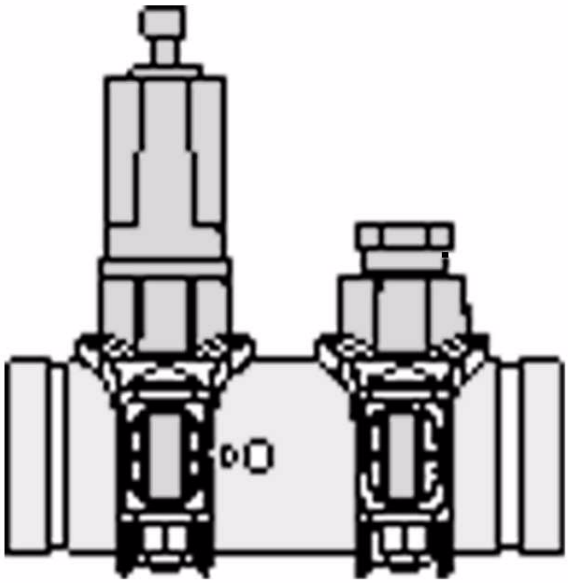
Flow Sensor Weld Fitting
Aluminum - p/n: 309010
Stainless Steel - p/n: 082-3060-00-0
Steel - p/n: 309020

2.17 CHECK VALVE MANIFOLDS

The check valve manifolds include flow sensors, check valve/injector fittings and single or dual waterway check valve flappers. End connections for the manifolds are 3" (76mm) Vitaulic.

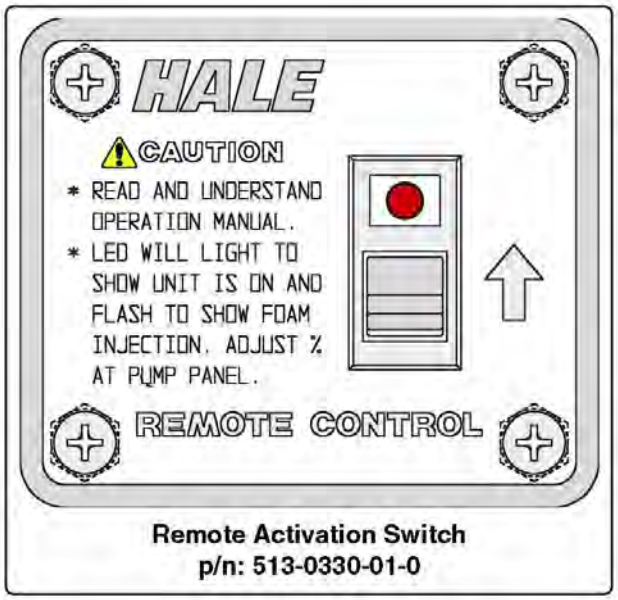


Dual Check Valve (DCV) Manifold
p/n: 108751

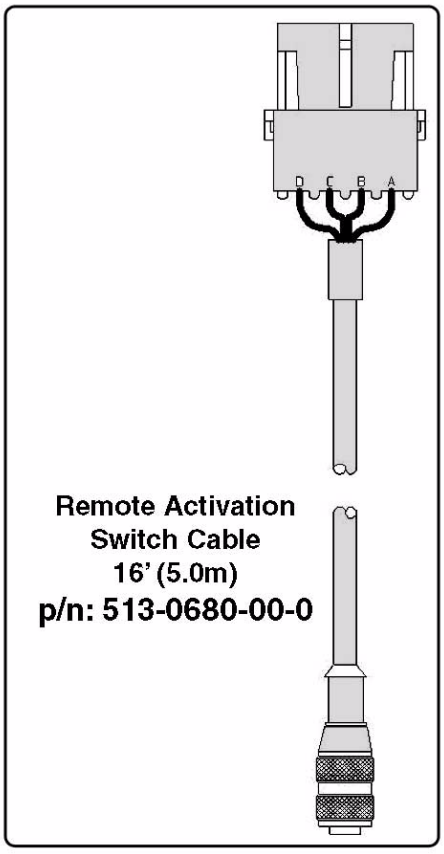


Single Check Valve (SCV) Manifold
p/n: 108893

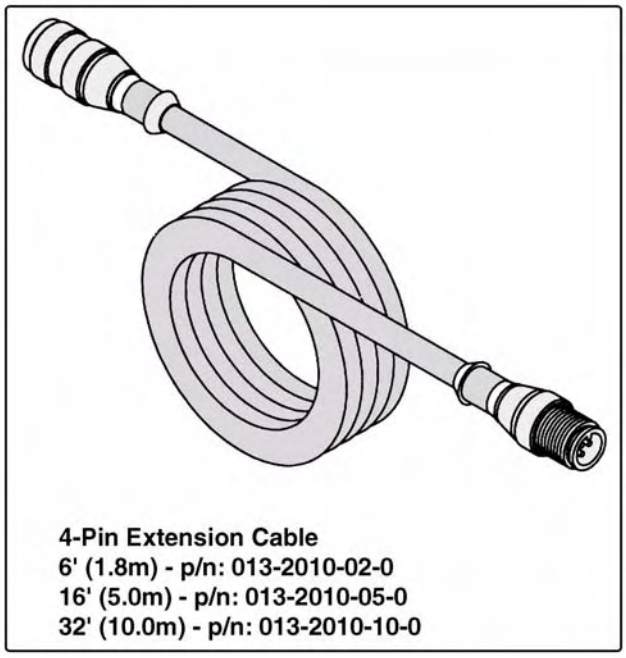
2.18 REMOTE ACTIVATION SWITCH OPTION



Remote Activation Switch
p/n: 513-0330-01-0

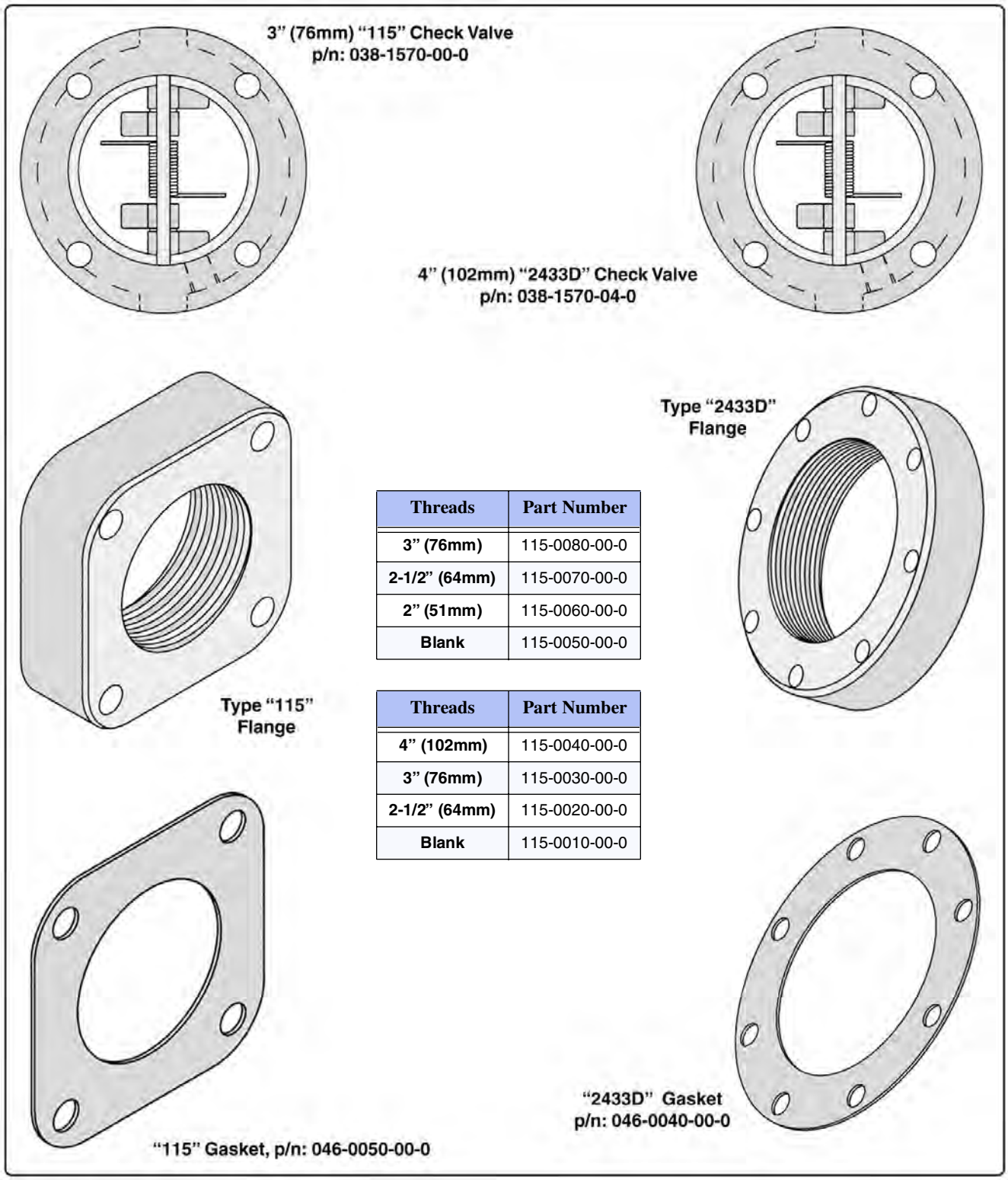


Remote Activation Switch Cable
16' (5.0m)
p/n: 513-0680-00-0



4-Pin Extension Cable
6' (1.8m) - p/n: 013-2010-02-0
16' (5.0m) - p/n: 013-2010-05-0
32' (10.0m) - p/n: 013-2010-10-0

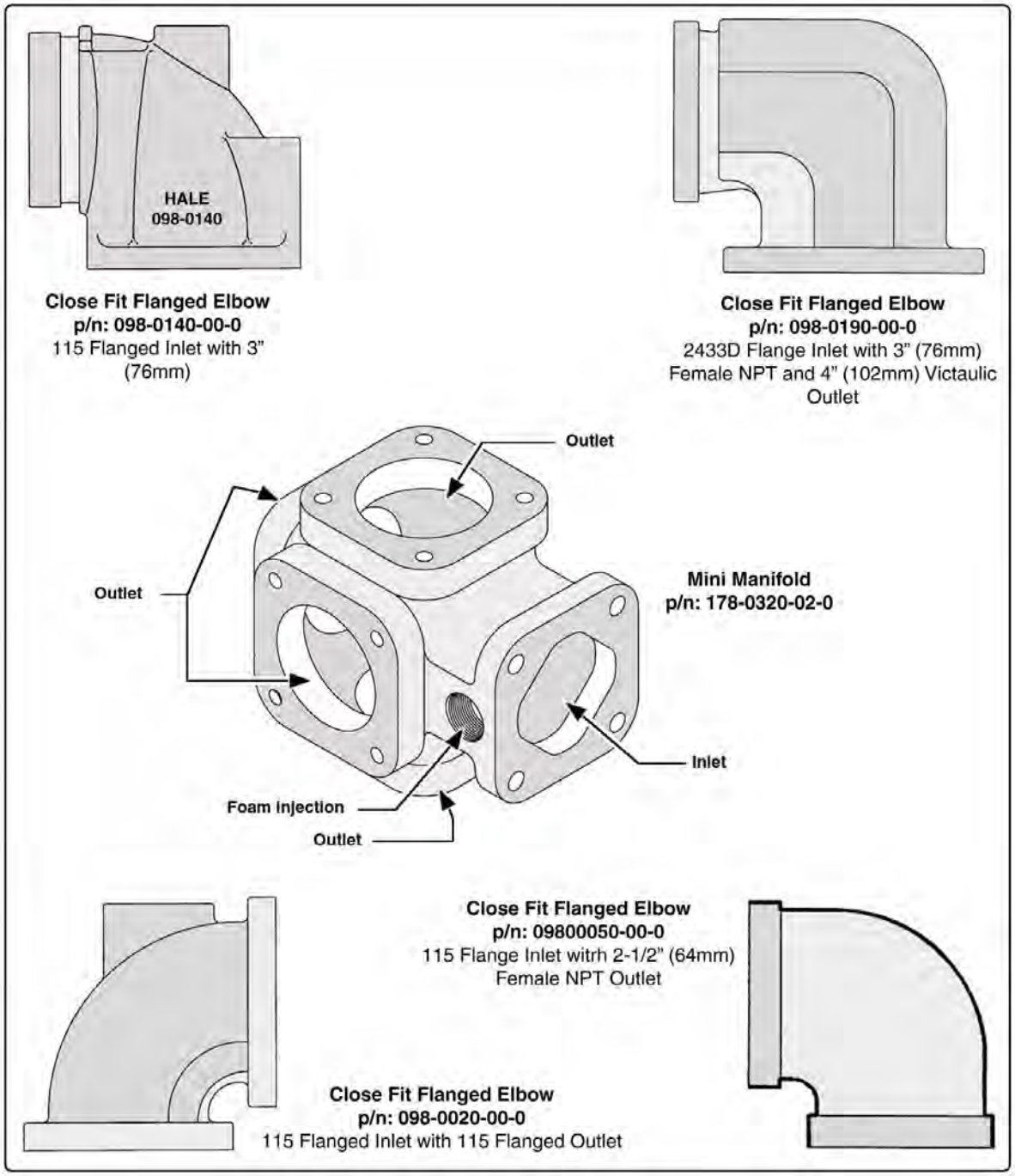
2.19 CHECK VALVES, FLANGES, GASKETS



Threads	Part Number
3" (76mm)	115-0080-00-0
2-1/2" (64mm)	115-0070-00-0
2" (51mm)	115-0060-00-0
Blank	115-0050-00-0

Threads	Part Number
4" (102mm)	115-0040-00-0
3" (76mm)	115-0030-00-0
2-1/2" (64mm)	115-0020-00-0
Blank	115-0010-00-0

2.20 ELBOWS AND MINI MANIFOLDS



2.21 HALE FOAM SYSTEM LAYOUT DRAWINGS

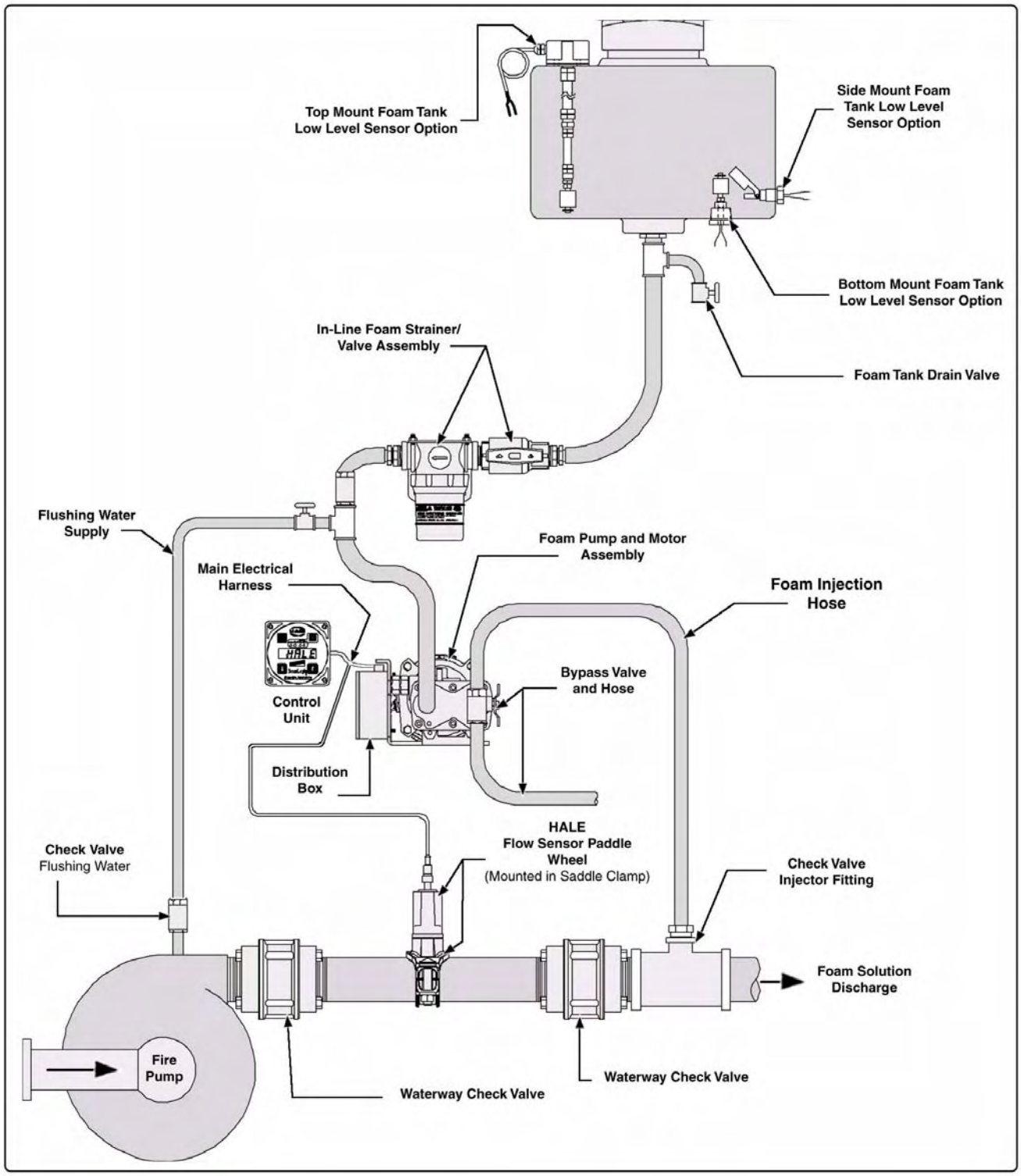


Figure 2-10: Typical Single Foam Concentrate Tank

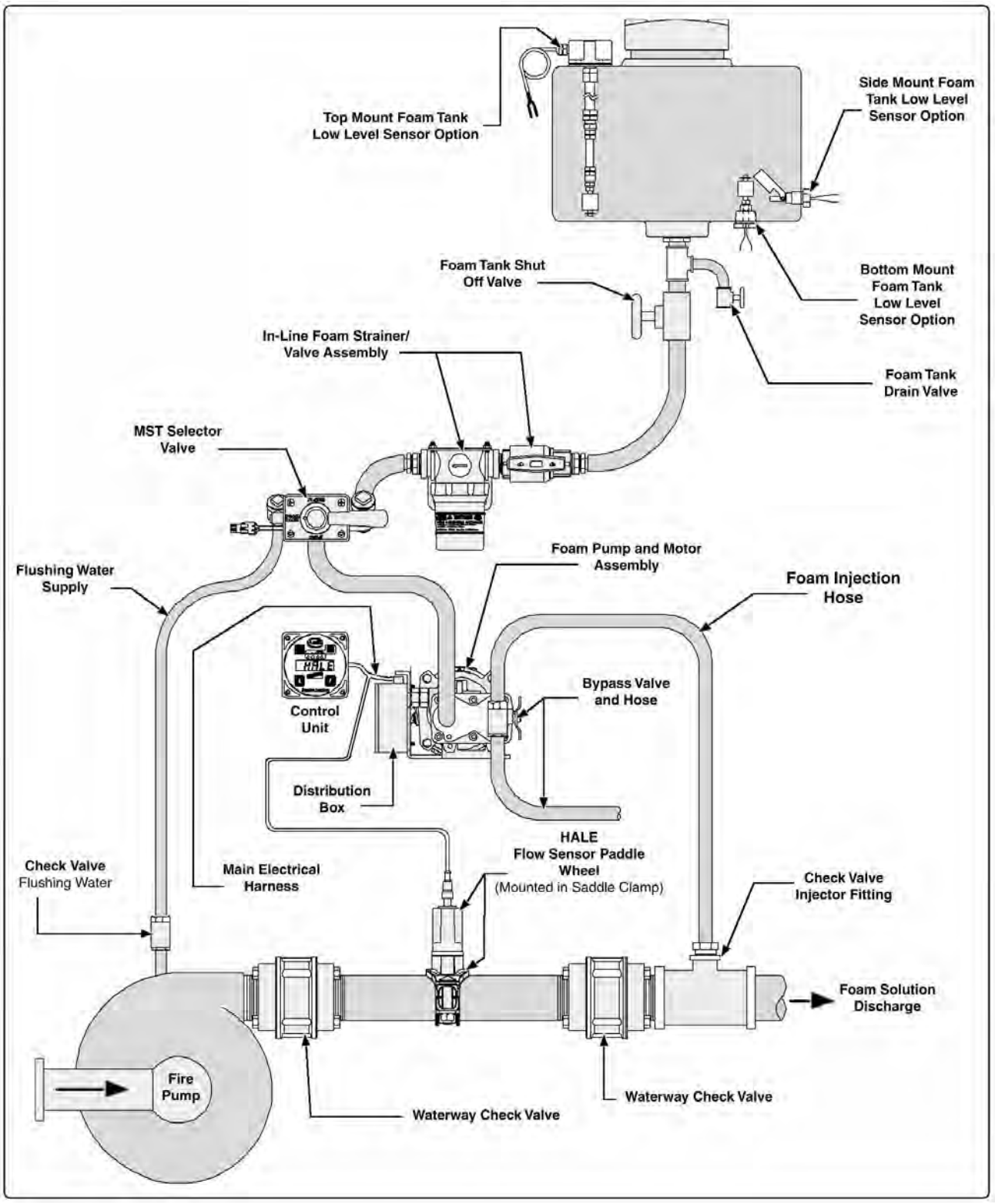


Figure 2-11: Single Foam Tank with MST and In-Line Strainer/Valve Assembly

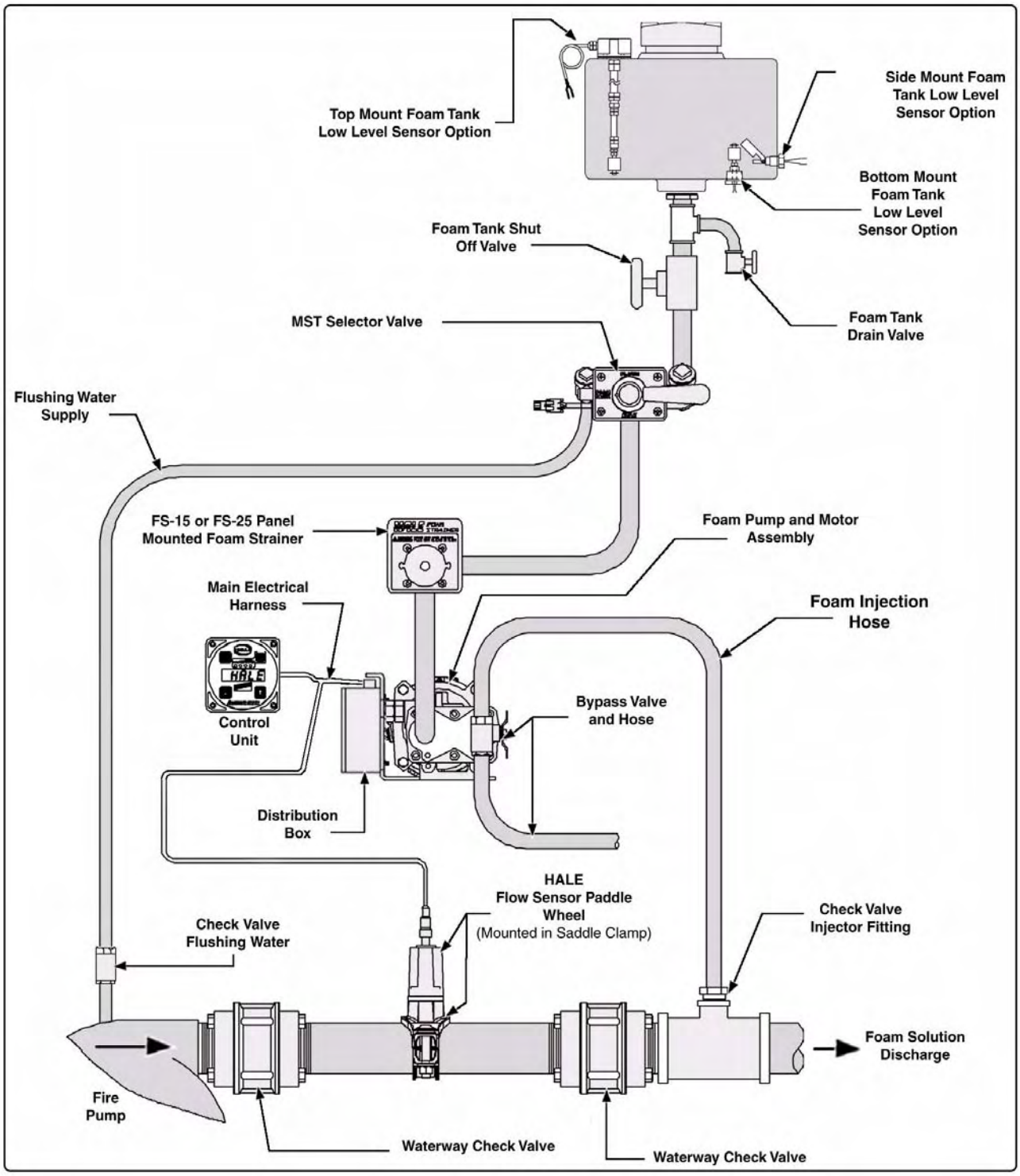


Figure 2-12: Single Foam Tank with MST and FS Series Strainers

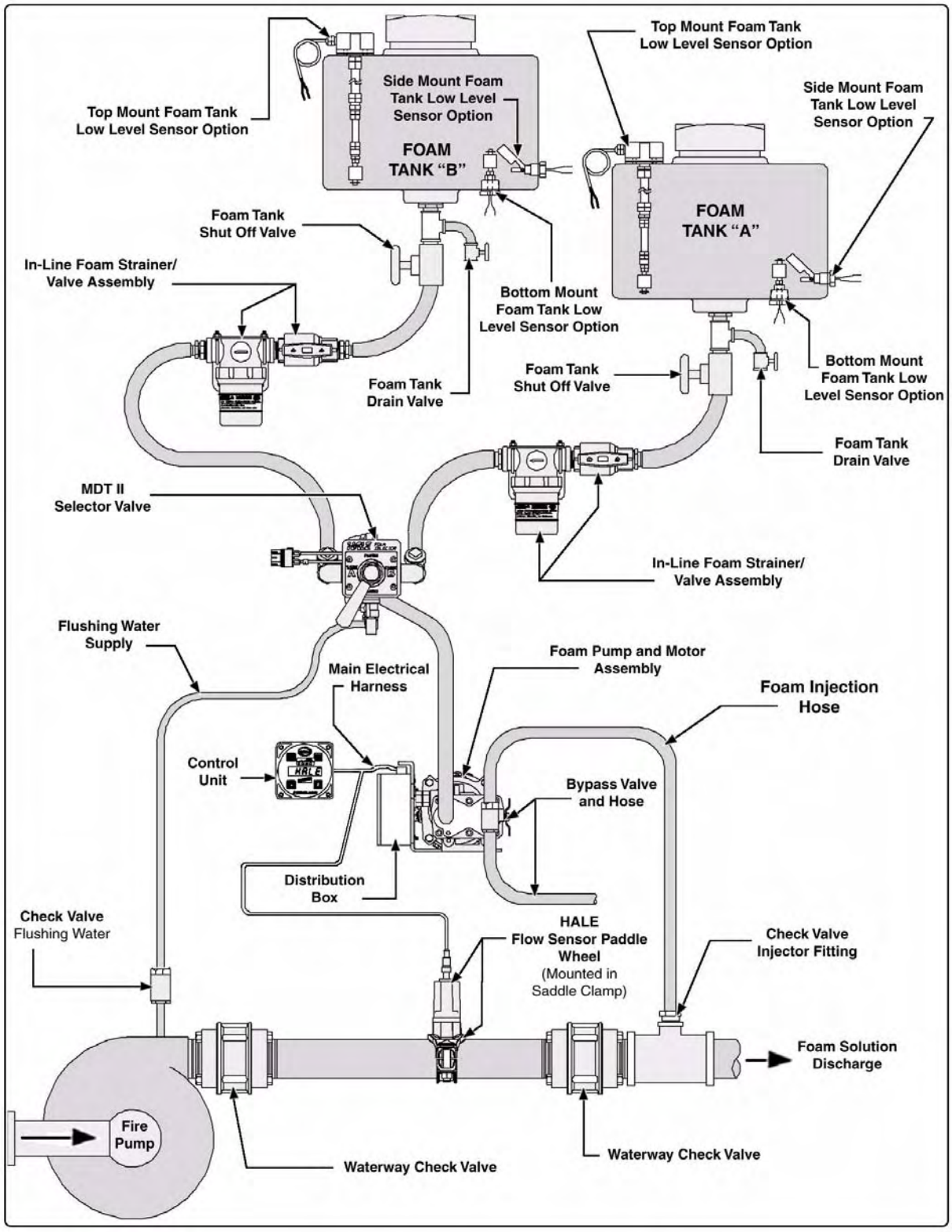


Figure 2-13: Dual Foam Concentrate Tanks, with MDT II and In-Line Strainer/Valve Assembly

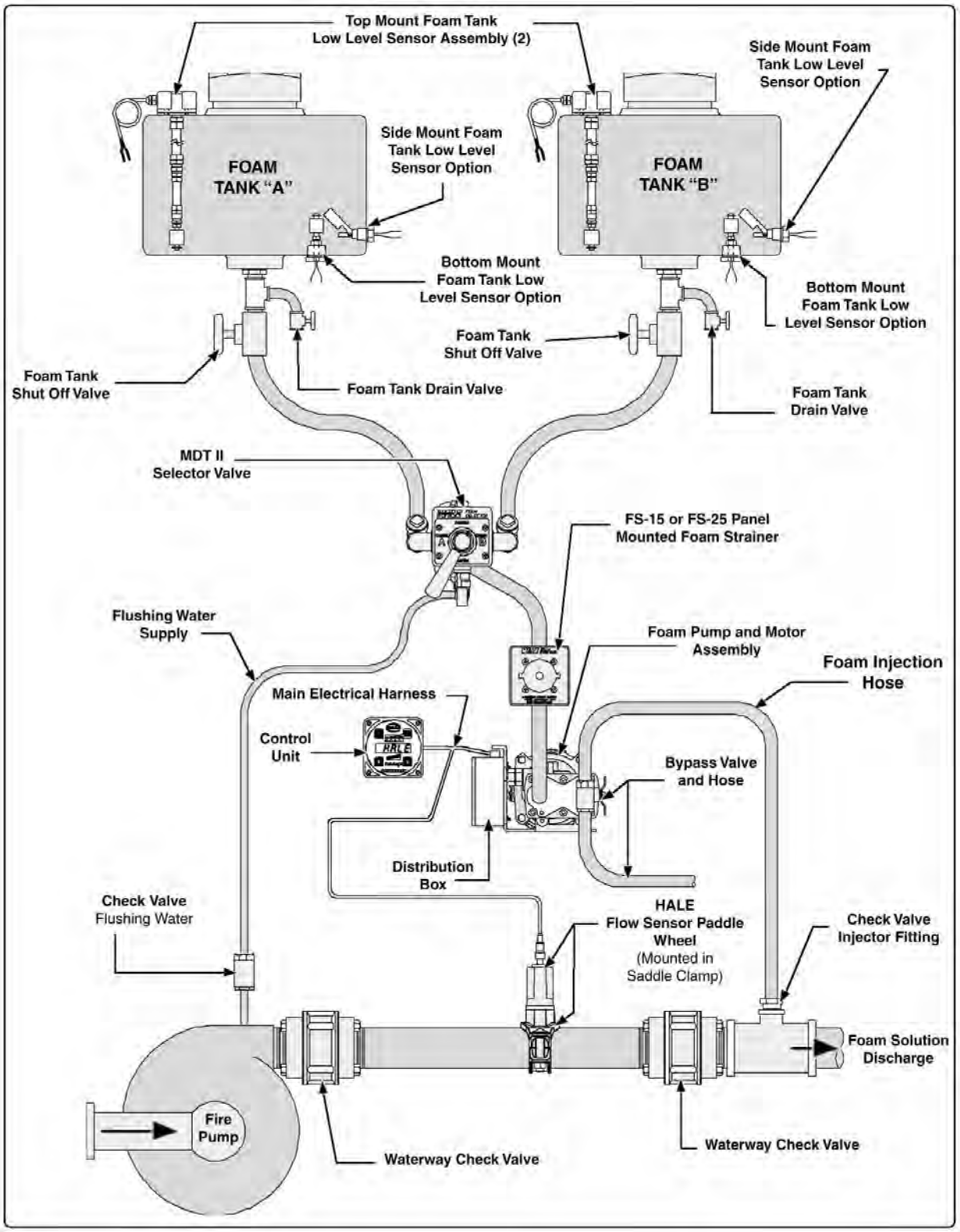


Figure 2-14: Dual Foam Concentrate with MDT II and FS Series Strainer Assembly

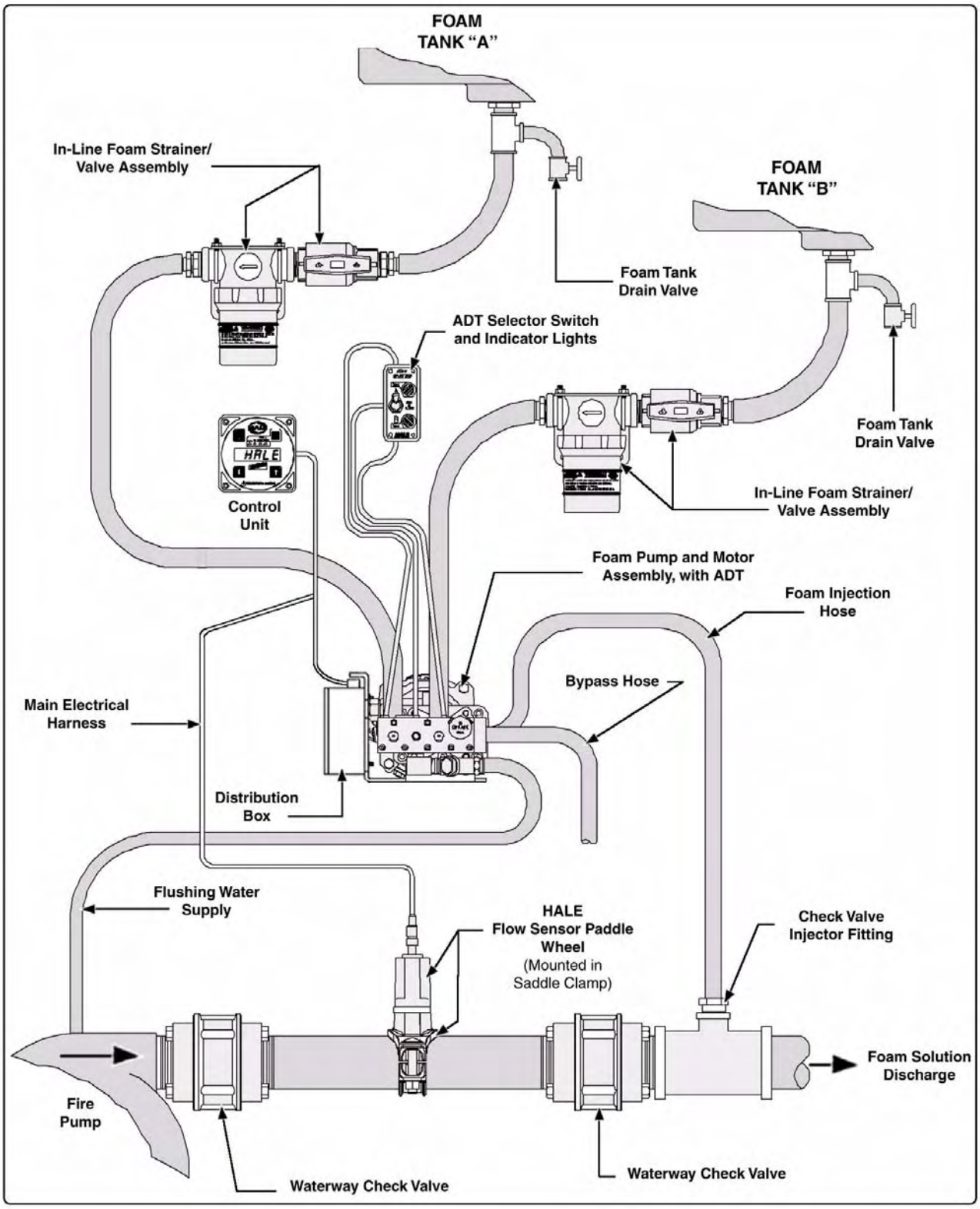


Figure 2-15: Dual Foam Concentrate Tanks, with ADT and In-Line Strainer/Valve Assemblies

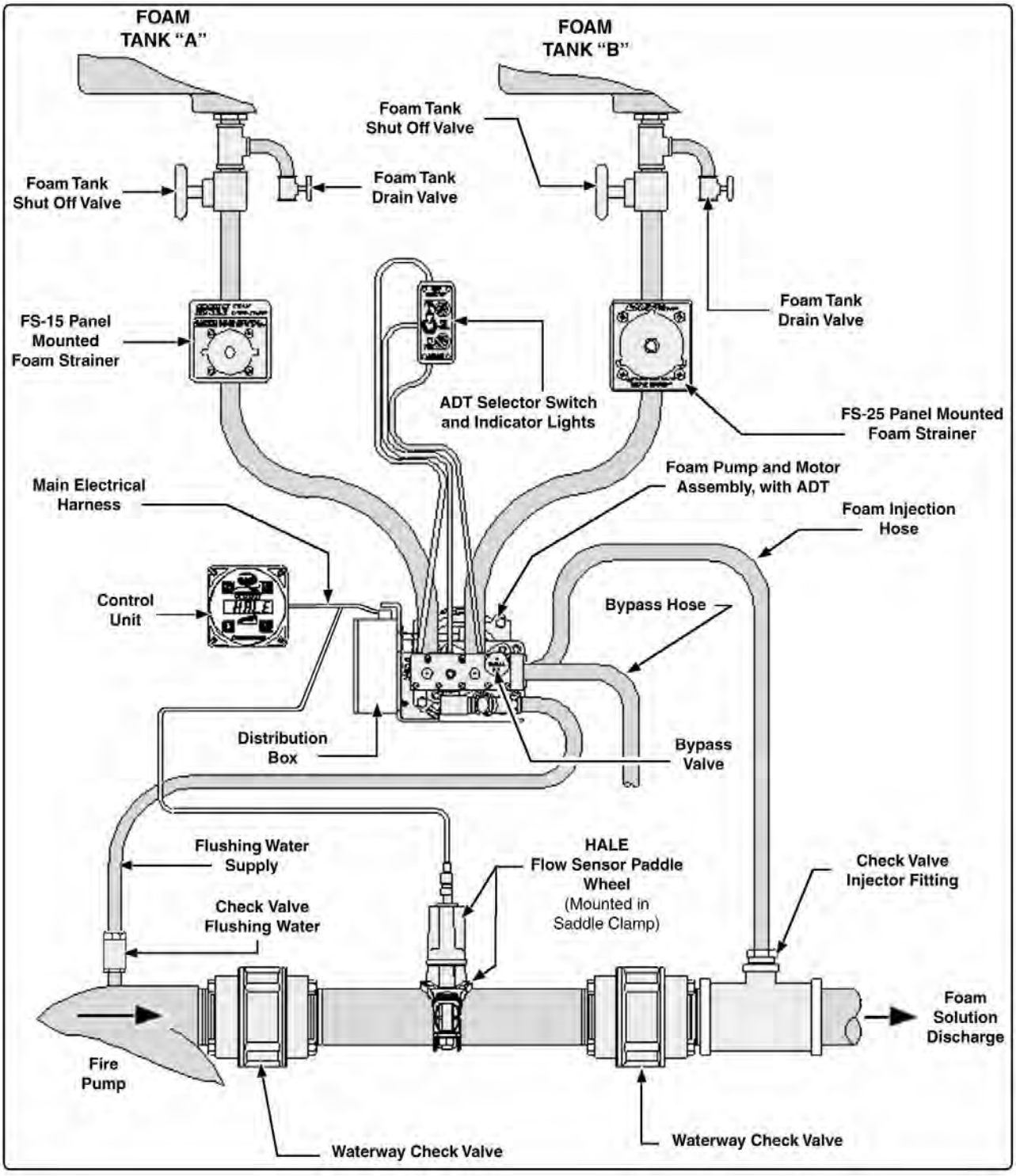


Figure 2-16: Dual Foam Concentrate Tanks with ADT and FS Series Strainer Assemblies

Notes

3 Installation

Carefully review the procedures that follow to ensure the system is properly designed. This section lists components that have been tested with Hale FoamLogix and provide the best system performance. Using the recommended materials and specified parts ensures a virtually maintenance free installation.

Differences in apparatus plumbing and foam system configuration make it impractical to show exactly how the Hale FoamLogix 3.3, 5.0 or 6.5 system is installed on a particular apparatus. The information contained in this section applies to most situations and should be used when designing and installing a Hale FoamLogix 3.3, 5.0 or 6.5 system. System plumbing and electrical diagrams are provided to assist with installation.

Before proceeding with system installation, carefully review the procedures that follow to ensure the system is properly designed.

The Hale FoamLogix system is supplied with six major components that must be located on the apparatus.

- ❑ Foam pump and motor assembly
- ❑ Control unit
- ❑ In-Line foam strainer/valve assembly
- ❑ Instruction/system diagram placard
- ❑ Flow Sensor
- ❑ Check valve injector fitting

Notes: The flow sensor and check valve injector fitting may be pre-mounted, if a manifold or pre-configured package is ordered.

Optional components that require mounting on the apparatus include:

- ❑ ADT operating switch and indicator lights
- ❑ Flanged elbows
- ❑ Foam tank(s)
- ❑ FS-15 or FS-25 panel mounted foam strainers
- ❑ Manual “dual” tank (MDT II) selector valve
- ❑ Manual “single” tank (MST) selector valve
- ❑ Mini Manifold
- ❑ Remote activation switch

IMPORTANT !

WHEN DETERMINING THE LOCATION OF THE HALE FOAMLOGIX COMPONENTS BEING INSTALLED KEEP IN MIND PIPING RUNS, CABLE ROUTING AND OTHER INTERFERENCES THAT COULD HINDER OR INTERFERE WITH PROPER SYSTEM PERFORMANCE.

3.1 FOAM PUMP AND MOTOR ASSEMBLY

Ideally, the foam pump and motor assembly should be located in an area that is protected from road debris and excessive heat buildup. The back of a compartment or a compartment shelf is often an ideal location. The foam system master power switch and bypass valve are located on the foam pump and motor assembly. Access to these components must be provided.

The foam pump and motor assembly must be mounted below the discharge of the foam tank(s) to provide for gravity feed to the foam pump. The foam tank(s) must be located where refilling can be easily accomplished with 5 gallon (19 liter) pails and other methods suitable to the end user. Most water tank manufacturers build the foam tank into the booster tank.

When specifying a foam tank(s), make sure provisions are made for:

- ❑ Installation of the low tank level sensor
- ❑ Foam suction connections
- ❑ Tank drainage
- ❑ Proper fill openings, per NFPA requirements

In addition, a foam tank refill system may be required. See Hale EZFill Foam Tank Refill System for these installation requirements.

3.2 FOAM CONCENTRATE STRAINER

Determine a location on the apparatus to mount the foam strainer.

CAUTION !

THE IN-LINE STRAINER/VALVE ASSEMBLY IS A LOW PRESSURE DEVICE THAT WILL NOT WITHSTAND FLUSHING WATER PRESSURE. WHEN INSTALLING THE IN-LINE STRAINER IN SYSTEMS EQUIPPED WITH HALE "MDT II" OR HALE "MST," MAKE SURE THE IN-LINE STRAINER/VALVE ASSEMBLY IS IN THE HOSE ON THE INLET SIDE OF THE VALVE.

CAUTION ! - continued

IF THE STRAINER IS SUBJECT TO FLUSHING WATER PRESSURE, USE HALE "FS" SERIES STRAINERS.

Mount the in-line foam strainer/valve assembly in the foam concentrate hose from the foam tank to the foam pump suction connection, ADT, MDT II or MST.

If panel mounted FS series strainers are installed, mount the strainer in the foam concentrate hose that supplies concentrate to the ADT, MDT II or MST. The FS series strainer may also be mounted in the outlet hose of the MDT II or MST.

IMPORTANT !

WHEN DETERMINING THE STRAINER LOCATION KEEP IN MIND THE REQUIREMENT FOR GRAVITY FEED OF FOAM CONCENTRATE TO THE FOAM PUMP THROUGH THE STRAINER AND AVOID AIR TRAPS IN THE HOSES. ALSO, CLEARANCE MUST BE PROVIDED TO ALLOW REMOVAL OF THE BOWL ASSEMBLY TO CLEAN THE STAINLESS STEEL MESH, TO MAKE HOSE CONNECTIONS TO THE STRAINER AND FOR OPERATION OF THE SERVICE VALVE.

The installer must provide a strainer service isolation valve in the foam concentrate hose to prevent spillage during service. An MST or MDT II can serve this purpose.

3.3 CONTROL UNIT / INSTRUCTION PLACARD

Determine a location on the operator panel of the apparatus for the control unit and instruction/system diagram placard, if provided. These components must be located at the main pump operator position in close proximity to each other. Consideration must be given for routing the control cable from the control unit to the distribution box on the foam pump and motor assembly.

If necessary, order longer or shorter cable assemblies to suit the location demands.

3.4 INSTALLER SUPPLIED COMPONENTS

Due to the many differences in apparatus configurations and design requirements, the Hale FoamLogix system installer must supply components, such as,

- ❑ Mounting brackets
- ❑ Piping
- ❑ Hoses
- ❑ Fittings
- ❑ Electrical wiring

The following guidelines are recommendations for selection of additional components for a complete system installation. These recommendations reflect materials and components that are tested extensively with Hale FoamLogix systems and provide proven reliable performance.

Foam Concentrate Suction Hose

The system installer must supply fittings and hoses from the foam tank to the inlet of the foam pump. All components selected transfer foam concentrate, therefore they must be compatible with the foam concentrates being used in the system.

Hoses for Class “A” foam concentrates have minimum 3/4” (19mm) inside diameter. Hoses for Class “B” foam concentrates must have a minimum 1” (25.4mm) inside diameter due to higher viscosity of the concentrate.

Note: Certain types of Class “B” AFFF-ARC or ATC concentrates require a 1-1/4” or 1-1/2” (32mm or 38mm) ID foam concentrate supply line.

Hoses for the foam concentrate suction that are not subject to high pressure, i.e., flushing water or foam concentrate discharge, must have a rating of 23” (584.2mm) Hg vacuum and 50 PSI (3.5 BAR) pressure or greater.

Note: NFPA requires that foam concentrate suction hose be clear to observe foam concentrate flow during foam pump operations.

Recommended Components

- ❑ **Hose:** PVC, Kuriyama Kuri-Tec K7130 series
- ❑ **Fittings:** Hose Barb Type; Brass, Stainless Steel or Nylon

Foam concentrate suction hose subjected to flushing water pressure must be rated for 23 in (584.2mm) Hg vacuum and the maximum discharge pressure of the fire pump (500 PSI [34 BAR] minimum). These hoses include the hose from the outlet of the MDT II or MST to the foam pump inlet.

Recommended Components

- ❑ **Hose:** Aeroquip 2580 Series or equivalent reinforced hydraulic hose
- ❑ **Fittings:** Brass or stainless steel hose end crimp or reusable type (Aeroquip 412 Series or equivalent)

A foam tank shut-off valve and drain valve should be provided in the foam tank suction hose to allow strainer service, tank drainage and easier priming. These components are subject to the same material characteristics and pressure ratings as stated above. When the In-line strainer/valve assembly option is installed the shut-off valve is included. A separate valve is not required.

Foam Concentrate Discharge Hose

The system installer must supply fittings and hoses from the foam pump inject connection to the check valve/injector fitting inlet. All components must be compatible with the foam concentrates being used in the system.

The foam pump discharge connection and the check valve injector fitting connection port is 1/2” (13mm) NPT threads. Hoses and fittings of 1/2” (13mm) inside minimum diameter rated at 500 PSI (34.5 BAR) working pressure or maximum discharge pressure of the fire pump must be used. Fittings and hoses must be compatible with all foam agents being used.

Recommended Components

- ❑ **Hose:** Aeroquip 2580-8 or equivalent reinforced hydraulic hose
- ❑ **Fittings:** Brass or stainless steel hose end crimp or reusable type (Aeroquip 412-9-8 or equivalent)

Note: Although air brake tubing has been used for foam concentrate discharge hose, it is not as flexible as the hydraulic hose and readily kinks during installation. Additionally, the air brake tubing may not meet NFPA 500 PSI (34 BAR) test requirements.

Foam Concentrate Bypass Hose

The foam concentrate bypass hose connection is 1/2" (13mm) NPT threads. Hoses and fittings of nominal 1/2" (13mm) inside diameter must be used as bypass hose. Since the bypass hose is used for calibration and draining the system it does not see high operating pressures; therefore, a hose with a lower pressure rating than the inject hose may be used.

Fittings and hoses used must be compatible with all foam agents expected to be used. Use fittings made of brass or 300 series stainless steel compatible with all foam concentrates.

Recommended Components

- **Hose:** Low pressure hydraulic hose (or air brake tubing. See Note on preceding page)
- **Fittings:** Brass or stainless steel

It is recommended that the foam concentrate bypass hose be long enough to extend past the apparatus running board to reach five (5) gallon (19 liter) containers, making foam pump setup and calibration simpler.

Check Valves

Check valves must be installed on the apparatus to prevent contamination of the foam concentrate with water and contamination of the fresh water tank with foam. For a typical system layout, see heading 2.21 "Hale Foam System Layout Drawings" on page 39.

NFPA standards require a check valve in the foam concentrate injection line at the injection point. The Hale p/n: 038-1790-00-0 Integral Check Valve/ Injector Fitting, a standard component included with the Hale FoamLogix 3.3, 5.0 or 6.5 system and installed when a manifold kit is ordered, meets these requirements and threads directly into the foam injection port on Hale manifolds.

Check valves must be installed in all water piping locations where foam concentrate could drain back into pumps or other components of the fire apparatus. As a minimum one check valve must be installed where the water piping that supplies foam solution connects to the fire pump discharge.

To more effectively keep foam contamination out of the fire pump and water tank, double check valves should be used. Separate two check valves by at least 6" to 8" (152 to 203mm) of piping to form a dead zone between the valves.

Individual drain lines should be used on each check valve. The waterway check valves must be rated for 500 PSIG (34.5 BAR) test pressure.

Hale 3" (76mm) "115" flange-type check valves (p/n: 038-1570-00-0) can be used for most installations on pumps with "115" style flanges. The Hale "115" flange type check valve has a 4-3/8" (111mm) bolt circle that fits standard Hale "115" flanges, as well as 4-3/8" (111mm) bolt circle discharge flanges on other pumps. These check valves are rated for pressures up to 500 PSI (34 BAR) and flows up to 750 GPM (2,839 LPM). Use 2-1/2" or 3" (64mm or 76mm) NPT threaded "115" flanges for mounting these check valves in piping runs.

Where higher flows and larger diameter piping is required, Hale offers a 4" (102mm) "2433" flange-type check valve (p/n: 038-1570-04-0). The "2433" valve has an 8 bolt, 5-3/4" (146mm) bolt circle and fits pump discharge openings and flanges having this configuration. The "2433" check valve has a pressure rating of 500 PSI (34 BAR) and a flow rating of 1,250 GPM (4,731 LPM). The Hale "2433" style flange (p/n: 115-0040-00-0) has an 8 bolt, 5-3/4" (146mm) bolt circle and 4" (102mm) NPT threads for in-line mounting of the 4" (102mm) check valve.

Flushing Water Hose

Flushing water connections for the Hale ADT, MDT II or MST require using 1/2" (13mm) inside diameter tubing and appropriate fittings. The tubing and fittings used must be capable of withstanding the maximum fire pump discharge pressure (500 PSI [34 BAR] minimum) and must be compatible with foam concentrates being used in the system.

When the ADT, MDT II or MST is installed, a check valve is used integral to the flushing water line connection. This provides protection against water system contamination with foam concentrate.

Note: The installer/builder should provide an additional check valve and shut-off valve where the flushing water hose connects to the water pump.

Hale recommends the use of one of the above selector options to provide foam system flushing capabilities. However, if the Hale FoamLogix system is ordered with the "no tank" option the system installer must maintain NFPA compliance. To be NFPA compliant, when flushing is required, the system installer must provide proper

- ❑ Hoses
- ❑ Shut-off valves
- ❑ Check valves

- ❑ Reducer/regulator
- ❑ Connections for flushing water for the system

Additionally, when the Hale FoamLogix is installed without a Hale provided selector some operating and system protection features are not available.

Foam Discharge Drains

Drains must be provided from foam capable discharge piping components to prevent freezing in cold weather. When designing the drain system care must be taken to prevent contamination of the water system with foam and the foam concentrate with water. Some multiple drain systems that allow individual drain lines to communicate also allow foam to bypass the installed check valves causing contamination of fire pump and the water or foam concentrate storage tanks.

Hale offers an optional manual or air-operated 6-port drain valve, Class1 Model MMD6 (p/n: 104961). The valve provides individual drains with a single control and is used for applications where a single point for multiple drains is required. If a Hale MMD6 drain valve is not used, individual drain lines and valves for foam capable discharge piping is recommended.

Electrical Requirements

The system installer must provide the primary power wire and a ground strap for the Hale FoamLogix system.

Primary power must be supplied from the main apparatus battery to the motor connectors on the foam pump and motor assembly. The Hale FoamLogix 3.3, 5.0 or 6.5 requires minimum 60 AMP electrical service.

Primary electrical power must be supplied directly from the battery or the battery master disconnect switch or solenoids to the Hale FoamLogix.

IMPORTANT !



OTHER ELECTRICAL COMPONENTS MUST NOT BE SUPPLIED FROM THIS WIRE. DO NOT CONNECT THE PRIMER AND HALE FOAMLOGIX TO THE SAME POWER WIRE.

The primary power connection must be made so that power is supplied to the Hale FoamLogix when the main apparatus electrical system is energized and the pump is in gear. Use of a solenoid with a 150 AMP peak, 85 AMP continuous rating is recommended. (See Figure 3-1: “Recommended Relay Wiring Schematic,” on page 55.)

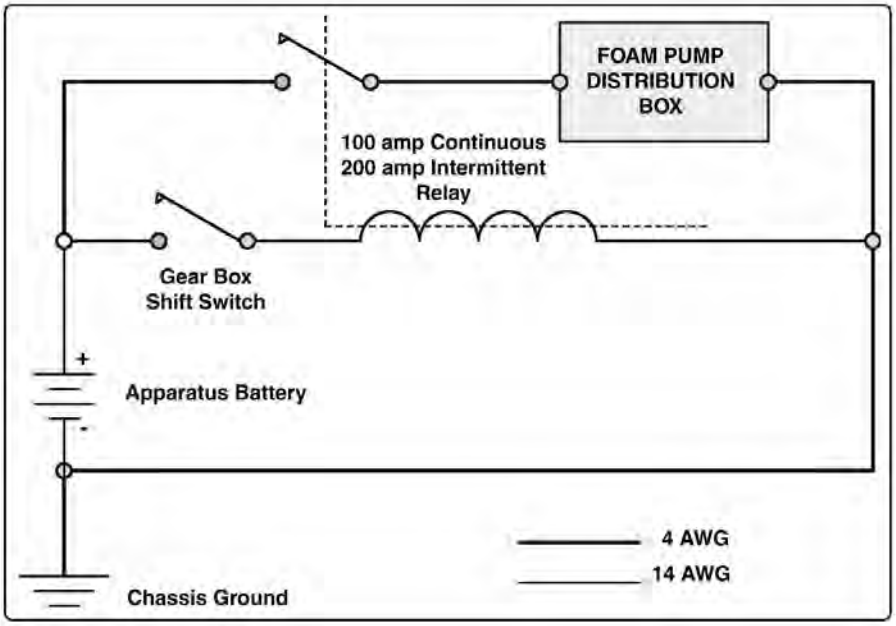


Figure 3-1: Recommended Relay Wiring Schematic

Note: This ensures immediate operation when the operator places the apparatus in PUMP mode, and to prevent battery power drain when the apparatus is not running.

With Hale FoamLogix 3.3, 5.0 or 6.5, cable lengths up to 6’ (1.8 meters) require a minimum 4 AWG type SGX (SAE J1127) battery cable. (See Table 3-2: “Primary Power Cable Sizes.”) Use solder lugs on cable ends with a 5/16” (8mm) diameter hole.

Recommended Primary Power Cable Sizes	
Wire Gauge	**Maximum Length**
4 AWG (21.1mm2)	6 Feet (1.8 meters) or Less
0 AWG (53.5mm2)	6 Feet (1.8 meters) to 15 Feet (4.6 meters)
00 AWG (67.5mm2)	15 Feet (4.8 meters) or Longer

Table 3-2: Primary Power Cable Sizes

When planning cable runs make sure the primary wires are routed by the shortest most direct route.

A braided flat ground strap connected to the apparatus chassis is recommended for the ground connection. This limits the RFI/EMI interference encountered with radios, computers or other sensitive electronic equipment.

The ground strap should be a minimum of 1-1/4” (32mm) wide and no longer than 18” (457mm). It must have soldered flat lug ends with 3/8” (10mm) diameter holes.

If the ground strap length exceeds 18” (457mm), a wider ground strap should be used or use a double thickness of 1-1/4” (32mm) wide ground strap. The ground strap must be connected to the chassis. Use minimum 5/16” (8 mm) diameter bolt or mounting to secure the strap.

Make sure the ground is attached directly to the chassis frame and not to the apparatus body work.

IMPORTANT !



BEFORE MAKING GROUND CONNECTIONS REMOVE ALL PAINT, GREASE AND COATINGS FROM THE CONNECTION AREA. AFTER MAKING CONNECTION, SEAL AGAINST CORROSION. WHEN A FLAT GROUND STRAP IS NOT AVAILABLE USE A BATTERY CABLE ONE SIZE LARGER THAN THE POWER CABLE USED.

FoamLogix Display

Power must be supplied to the FoamLogix display. The power required should be a clean power supply and should only be provided after the pump is placed in gear. Make display power and ground connections. Use minimum 16 AWG Type SXL or GXL (SAE J1127) wire. Using the harness provided:

- ❑ Connect the **BLACK** wire to a chassis ground stud
- ❑ Connect the **RED** wire to a minimum 5 AMP fused dedicated circuit. If a dedicated circuit is not available, connect to a terminal that has LOW current load items, such as ENFO IV, governor and tank level gauge, etc.

Foam Concentrate Tanks(s)

A foam concentrate tank(s) must be supplied to suit the capacity required for the apparatus application. The tank(s) must meet NFPA minimum standards for their design capacity, including:

- ❑ Filler size
- ❑ Vapor pressure venting

- ❑ Baffling
- ❑ Drain facilities

Foam tank capacities for the Hale FoamLogix 3.0, 5.0 or 6.5 are based on NFPA requirements for flammable liquid (Class “B”) fire suppression. (See Table 3-3: “Recommended Foam Tank Capacity.”)

FoamLogix	Recommended Tank Capacity
Model 6.5	100 Gallons (379 Liters)
Model 5.0	100 Gallons (379 Liters)
Model 3.3	66 Gallons (250 Liters)

Table 3-3: Recommended Foam Tank Capacity

Foam Pump Mounting

Position the foam pump and motor assembly in the desired location on the apparatus. When installing the foam pump and motor assembly, the assembly must be kept in a **HORIZONTAL** position with the base plate on the bottom. (See Figure 3-4: “FoamLogix Pump Installation.”)

Although the system is sealed and designed to be resistant to the harsh environment of fire fighting apparatus, a compartment with easy operator access is recommended.

The base plate of the foam pump and motor assembly must be anchored to a surface or structure that is rigid and of adequate strength to withstand the vibration and stresses of apparatus operation.

For mounting envelope dimensions of the FoamLogix 3.3, 5.0 or 6.5 foam pump and motor assembly see Figure 2-2: “Foam Pump Installation Envelope Dimensions” on page 25.



Figure 3-4: FoamLogix Pump Installation

Also see Figure 2-3: “Foam Pump Installation Envelope Dimensions, ADT Option Only” on page 26.

Position the foam pump so the bypass valve is easily accessible. When the Hale FoamLogix system is ordered without the ADT option, a separate bypass valve is included that may be removed from the foam pump and mounted on a truck panel for easier access.

When ordered with the ADT option, the operating knob may be removed from the bypass valve actuator and an extension rod installed to permit remote operation. In either instance, the foam pump and motor assembly must be located to permit proper operation of the bypass valve.

Make sure the foam concentrate hoses are properly routed to the inlet and outlet on the foam pump. Foam concentrate must gravity feed to the foam pump inlet from the foam tank(s).

The foam pump must be mounted in an area to avoid excessive engine exhaust system heat or accessory heat buildup.

The base of the foam pump and motor assembly includes 5/16" (8mm) diameter predrilled mounting holes. The apparatus mounting location must to be drilled accordingly. The base plate may be used as a template to mark mounting hole location. (See Figure 3-5: "Base Plate Mounting Hole Locations.")

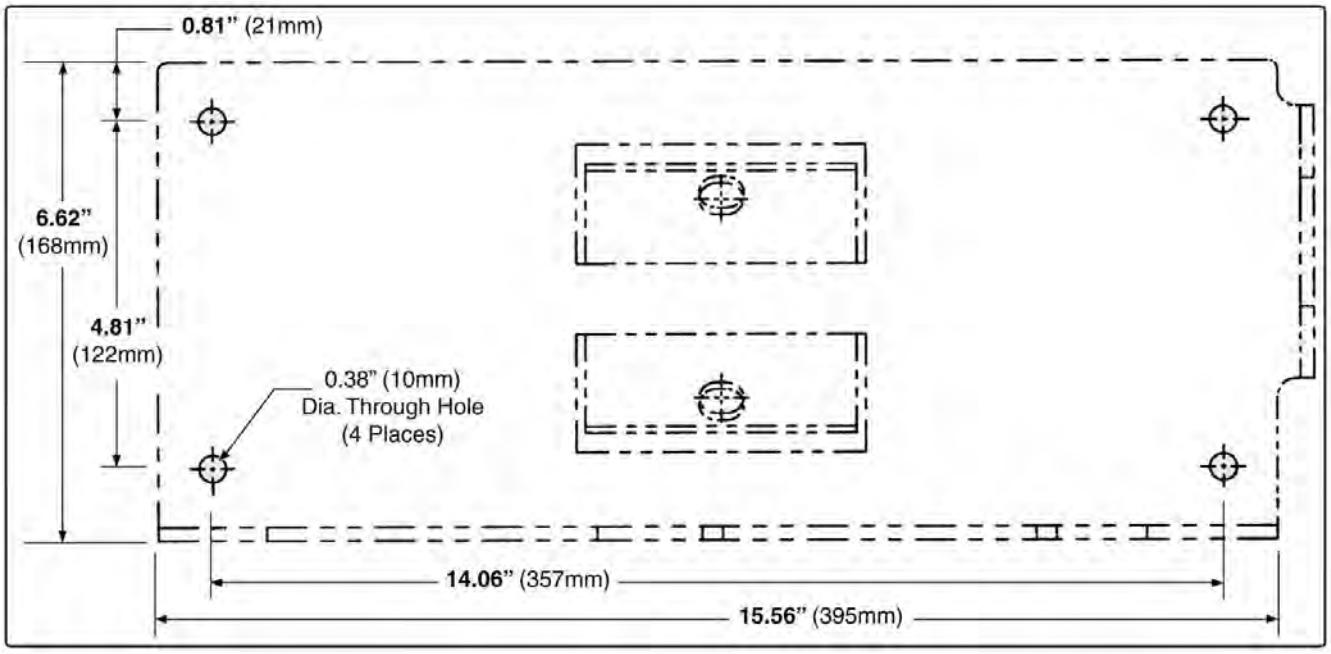


Figure 3-5: Base Plate Mounting Hole Locations

Plumbing Installation

Hale FoamLogix System plumbing diagrams are located in this section. The diagrams provide recommended guidelines for the installation of system components that handle water, foam concentrate and foam solution. The sequence in which the plumbing installation is performed depends on your individual installation requirements.

IMPORTANT !

AFTER INSTALLATION, MAKE SURE ALL PIPES, HOSES AND TUBES ARE PROPERLY SUPPORTED USING THE BEST INDUSTRY PRACTICES. USE A SUITABLE PIPE SEALING COMPOUND AT ALL JOINTS.

Water and Foam Solution Plumbing

When installing water and foam solution piping runs use the best industry practices. Use a suitable pipe sealing compound at all joints.

Check Valve Manifold

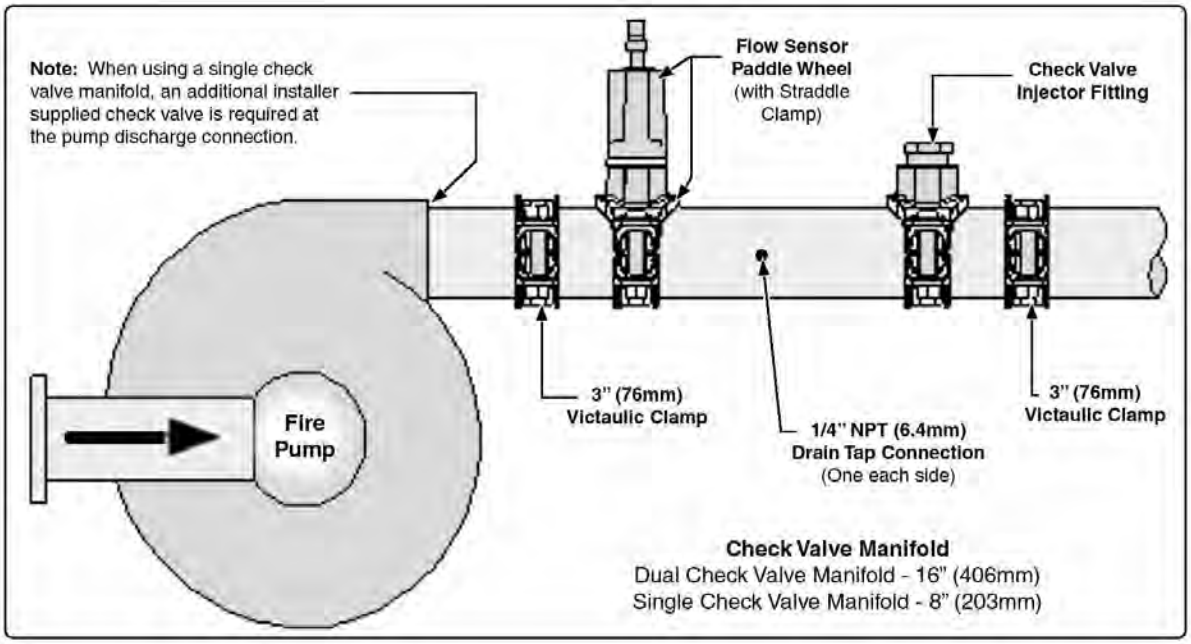


Figure 3-6: Typical Check Valve Manifold Installation

The Hale pre-made stainless steel foam manifolds are recommended. The manifolds are available in kits and eliminate the extra labor and leaks from large pipe thread connections.

The manifolds use 3” (76mm) Victaulic connections and are available in single or dual check valve configurations. (See Figure 3-6: “Typical Check Valve Manifold Installation,” on page 59.)

Note: When the manifold is installed, the drain tap must be placed in the “down” position and plumbed to an individual drain.

When properly mounted, the flow sensor and check valve/injector fitting are on the side of the manifold and one of the drain ports is on the bottom. The flow sensor should point upwards slightly to allow drainage of water and sediment. (See Figure 3-9: “Flow Sensor Tee Position Range,” on page 62.)

Optional Hale Piping Components

Hale piping components, such as 3” (76mm) and 4” (102mm) wafer-type check valves, “115” and “2433” series flanges, mini manifold, etc. are available to simplify installation of water and foam solution discharge piping.

The arrangement shown in Figure 3-7: “Typical Midship Pump Installation” on page 61, provides accurate proportioning across a wide range for up to four discharges from the mini manifold.

The Hale mini manifold provides a 1” (25.4mm) NPT tap for installation of the check valve/injector fitting.

The Hale mini manifold and elbow components offer 4-3/8” (111mm) diameter bolt circles and minimize fabrication and pipe work.

Figure 3-8: “4” (102mm) Check Valve Installation” on page 61 shows a suggested installation arrangement using Hale 4” check valves, pipe and Hale “2433” flanges.

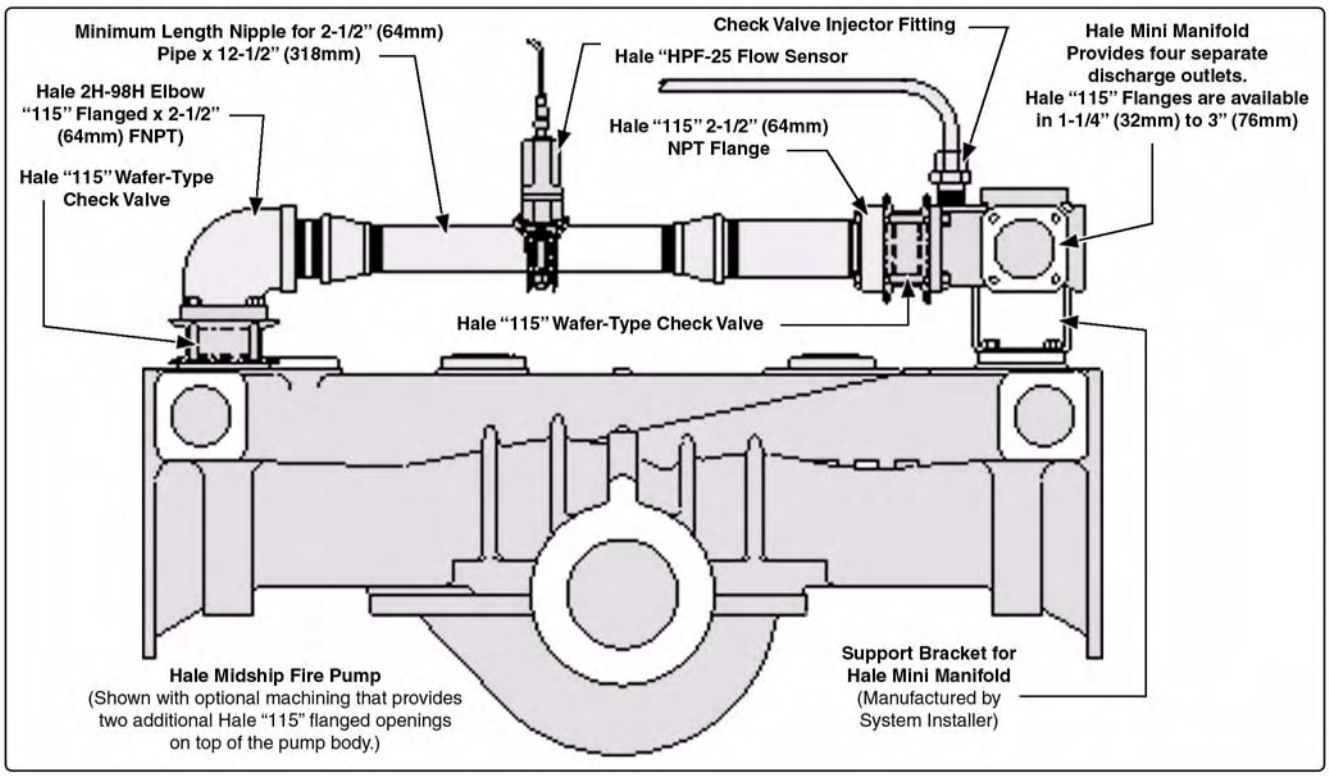


Figure 3-7: Typical Midship Pump Installation

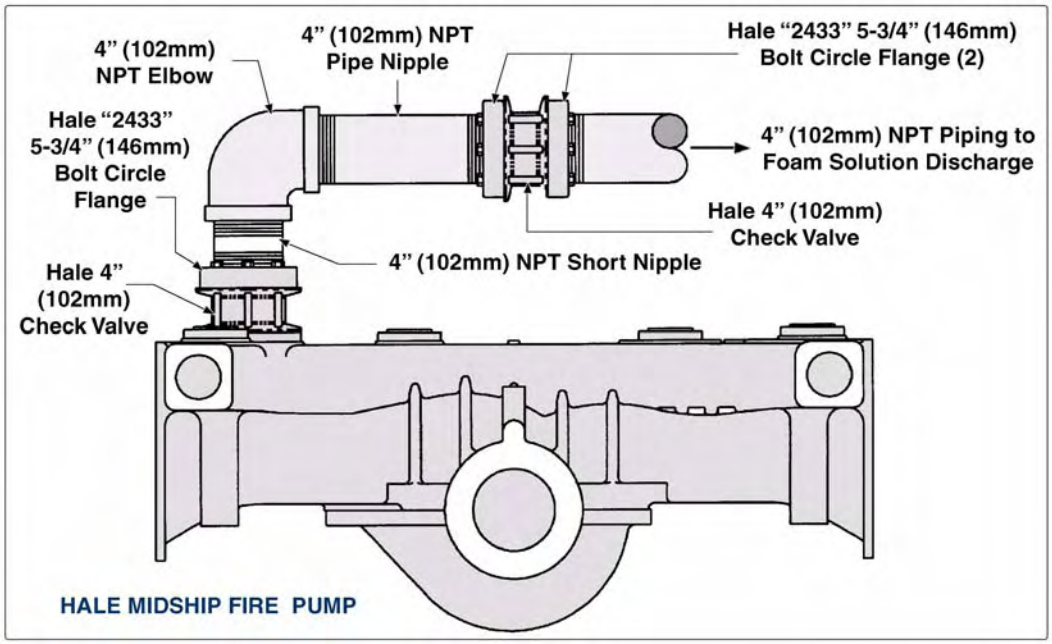


Figure 3-8: 4" (102mm) Check Valve Installation

"Waterway" Check Valves

Check valves in the waterway, rated at 500 PSI (34.5 BAR), are required to keep foam solution out of the main pump and allow pump priming without drawing foam into the piping.

Using double check valves, separated by at least 6" to 8" (152 to 203mm) of pipe before the foam injection point ensures that the pump and tank water remain uncontaminated.

Flow Sensor

The Hale FoamLogix flow sensor is specially designed to enable quick and easy sensor inspection and maintenance. The flow sensor paddle wheel is installed on a saddle clamp or weld fitting to the foam-capable discharge piping of the apparatus.

In horizontal piping runs, the flow sensor is mounted within the range shown in Figure 3-9: "Flow Sensor Tee Position Range."

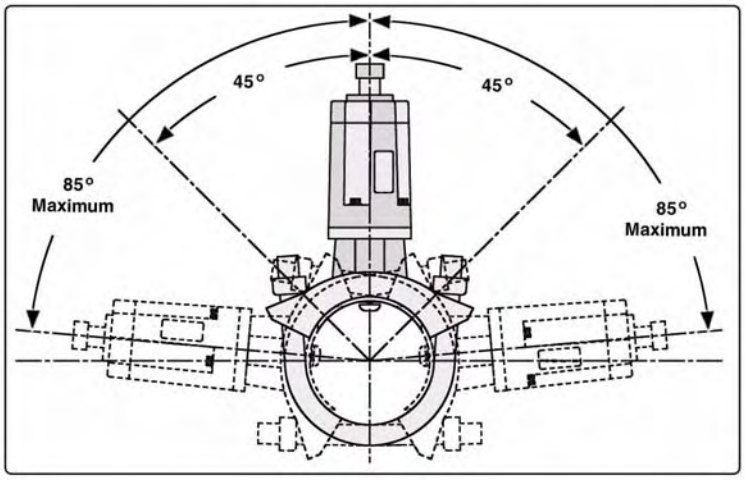


Figure 3-9: Flow Sensor Tee Position Range

The flow sensor is installed in the piping before the foam concentrate injection point.

When selecting a flow sensor, it is important to consider the minimum and maximum flow requirements during operation. Also see Table 3-10: "Pipe Size vs. Minimum Straight Run" on page 63.

Some applications may require flow sensor accuracy that is not within the range specified for the discharge piping. This is true in applications where the foam system needs to supply a 3" (76mm) deck gun, as well as a 1" (25.4mm) booster line.

Pipe size for flow sensor mounting must be selected to provide accuracy at the lowest flow rate. Mounting the flow sensor in a short section of pipe, one pipe size smaller (e.g., 4" to 3"; 3" to 2-1/2", etc.), provides better accuracy at the lower flows.

Refer to Table 3-10: “Pipe Size vs. Minimum Straight Run” for pipe size. Selecting the next smaller pipe permits reducing the straight pipe run the required distance prior to the flow sensor paddle wheel.

In the short length of reduced pipe pressure loss is minimal and there is minimal pressure loss through elbows and fittings. (See Figure 3-11: “Typical Reduced Size Sensor Piping Arrangement.”)

Pipe Sizes	Minimum Recommended Straight Run Pipe
1-1/2" (38mm)	9" (229mm)
2" (51mm)	12" (305mm)
2-1/2" (64mm)	15" (381mm)
3" (76mm)	18" (457mm)
4" (102mm)	24" (610mm)

Table 3-10: Pipe Size vs. Minimum Straight Run

Excessive turbulence in the flow sensor may produce unstable and inaccurate flow readings. The length of straight pipe prior to the flow sensor must be sufficient to reduce any turbulence in the pipe.

The following guidelines help attain the best readings, and maintain Hale FoamLogix system accuracy.

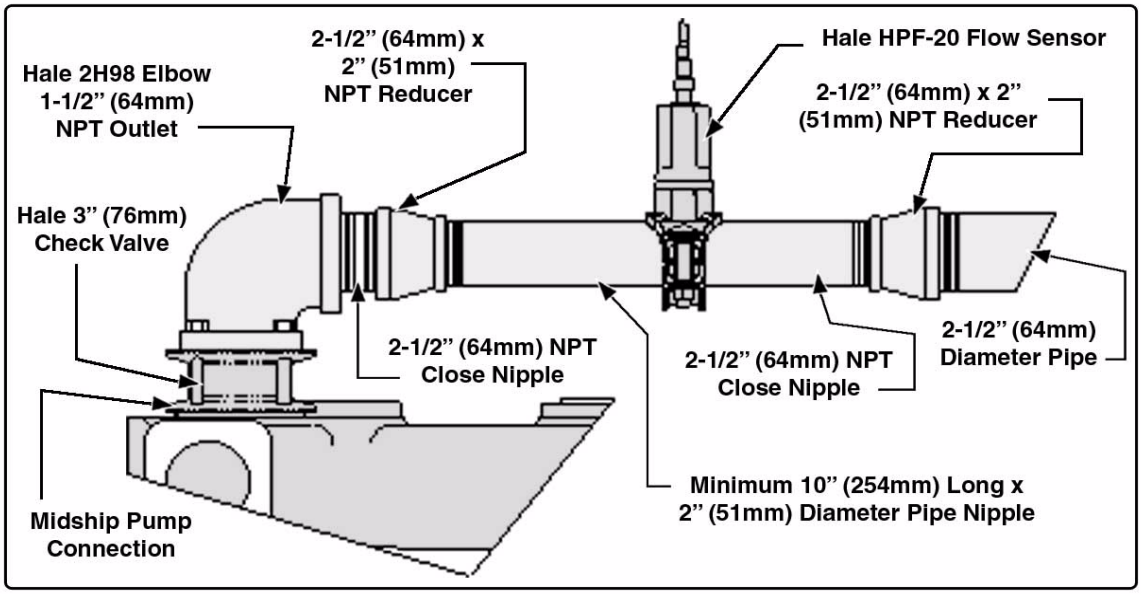


Figure 3-11: Typical Reduced Size Sensor Piping Arrangement

A minimum of **6 times the pipe diameter** of straight run pipe without any fittings is necessary prior to the flow sensor paddle wheel. (See Figure 3-12: “Flow Sensor Placement,” on page 64.)

The downstream piping length is not as critical, but there must be a short length of straight pipe with no fittings or valves immediately after the flow sensor paddle wheel. Two to three times the pipe diameter is recommended.

Do not mount a flow sensor directly after an elbow or valve. Valves create severe turbulence when they are “gated.”

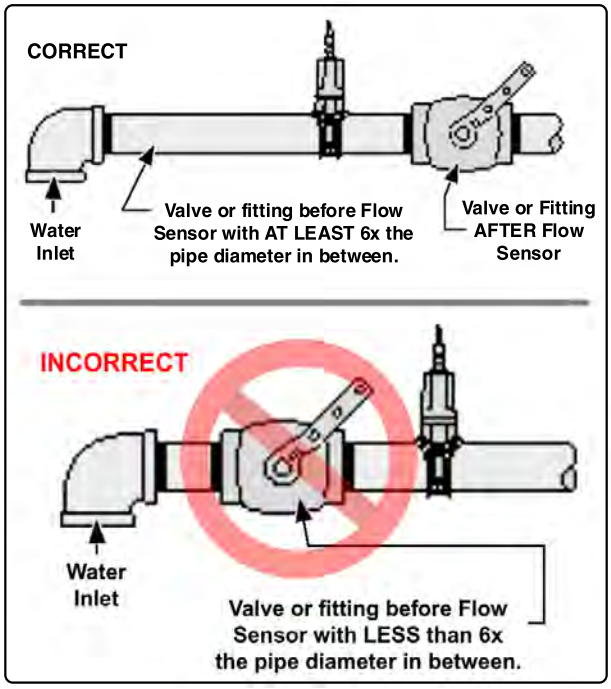


Figure 3-12: Flow Sensor Placement

Saddle Clamp Installation

(See Figure 3-13: “Flow Sensor/Saddle Clamp Installation,” on page 65.)

IMPORTANT !

THE PADDLE WHEEL SHOULD BE INSTALLED AS CLOSE TO UPRIGHT AS POSSIBLE WITHIN THE RANGE SHOWN FIGURE 3-9: “FLOW SENSOR TEE POSITION RANGE” ON PAGE 62. FOR PROPER OPERATION DO NOT LET THE FLOW SENSOR ROTATE MORE THAN 85° IN EITHER DIRECTION.

Installation of the Paddle Wheel Flow Sensor using a saddle clamp requires a 1.385”/1.390” (35/35.3mm) bored hole in the pipe. A minimum of six (6) times the pipe diameter of straight run pipe without any fittings is necessary prior to the position of this hole.

The flow sensor requires a spacer and eight stainless steel internal hex head screws. These are supplied with the sensor.

Four 6-32 x 1/2” screws attach the spacer to the saddle clamp mount, and four 6-32 x 3/4” screws with lock washers attach the paddle wheel to the spacer.

Align the indexing pin of the saddle clamp to the indexing hole of the spacer to align the saddle clamp mount. Secure with four 1/2" (13mm) machine screws, without lock washers. Torque to 8.5 in.-lbs. (1.0 N-m).

Align the paddle wheel indexing pin to the indexing hole in the spacer and secure using four 3/4" screws and lock washers. Torque to 7.5 in.-lbs.
(0.9 N-m).

Apply a small amount of grease to the saddle clamp gasket before the final installation of the assembly onto the pipe. Firmly tighten the saddle clamp onto the pipe.

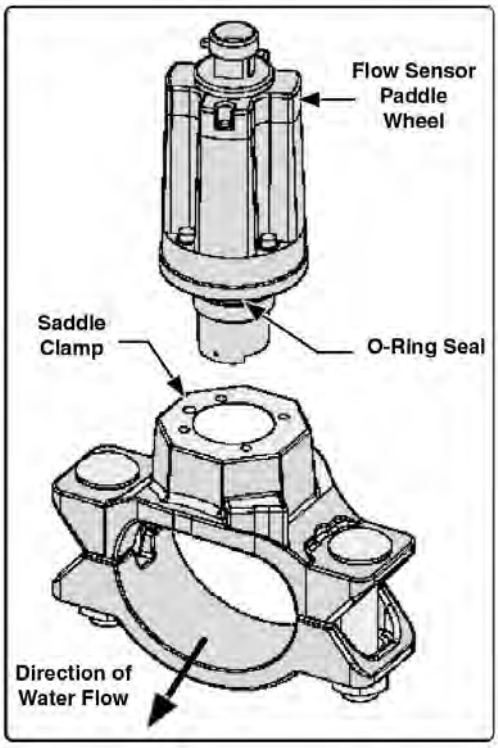


Figure 3-13: Flow Sensor/Saddle Clamp Installation

Foam Pump Flush System

Dual Tank System

Flushing water must be provided to flush the system of foam concentrate after each use. This prevents adverse reactions of some foam concentrates should they mix together. The Hale ADT and MDT II each have provisions for connecting flushing water to the foam concentrate injection system.

Single Tank System

The Hale MST provides a selector valve and gives the system flush capabilities for NFPA compliance. A fitting provided on the Hale MST simplifies the flushing water connection.

No Tank Option

The system installer must provide a flushing water supply to comply with NFPA standards.

The flushing water hose must be a minimum of 1/2" (12 mm) inside diameter and capable of withstanding the maximum fire pump discharge pressure, 500 PSI (34 BAR) minimum. The flush water supply should be provided from one of the pressure taps on the discharge of the fire pump.

It is recommended that a check valve be installed at the pressure tap to prevent contamination. Flush water thread connections are:

- ADT - 1/2" (13mm) NPT
- MDT II and MST - 1/4" (6.4mm) NPT

The system installer must provide proper fittings for these connections.

Foam Concentrate Plumbing

CAUTION !



MAKE SURE THE FOAM TANK AND FOAM CONCENTRATE SUCTION HOSES ARE CLEAN BEFORE MAKING FINAL CONNECTIONS TO FOAM PUMP.

FLUSH TANK AND HOSES PRIOR TO MAKING CONNECTIONS. MAKE SURE FOAM CONCENTRATE IS GRAVITY FED FROM THE TANK TO THE PUMP.

Foam concentrate plumbing consists of:

- Foam concentrate suction hose
- Foam strainer
- Foam concentrate discharge hose
- Check valve/injector fitting

Foam Strainer Connection (In-Line Strainer/Valve)

CAUTION !



THE IN-LINE STRAINER/VALVE ASSEMBLY, MOUNTED ON THE FOAM PUMP INLET, IS A LOW PRESSURE DEVICE. IT CANNOT WITHSTAND FLUSHING WATER PRESSURE. WHEN INSTALLING THE IN-LINE STRAINER EQUIPPED WITH HALE MDT II OR MST, MAKE SURE THE IN-LINE STRAINER/VALVE ASSEMBLY IS IN THE HOSE ON THE INLET SIDE OF THE VALVE. IF THE STRAINER IS SUBJECT TO FLUSHING WATER PRESSURE, USE HALE FS SERIES STRAINERS.

The strainer/valve assembly has 1-1/4" (32mm) NPT female threaded ports. Fittings are supplied for connection to the following inside diameter hose, depending on the viscosity of foam concentrates used. (See Figure 3-14: "In-Line Strainer/Valve Installation," on page 67.)

- ❑ 3/4" (19mm)
- ❑ 1.00" (25mm)
- ❑ 1-1/4" (32mm)

Use 3/4" (19mm) inside diameter hose for Class "A" foam and a 1.00" (25mm) inside diameter hose for Class "B" foams. For high viscosity Class "B" foam concentrates use 1-1/4" (32mm) or 1-1/2" (38mm) inside diameter hose. (See Figure 3-14: "In-Line Strainer/Valve Installation," on page 67.) A bracket is included to permit installation on the apparatus.

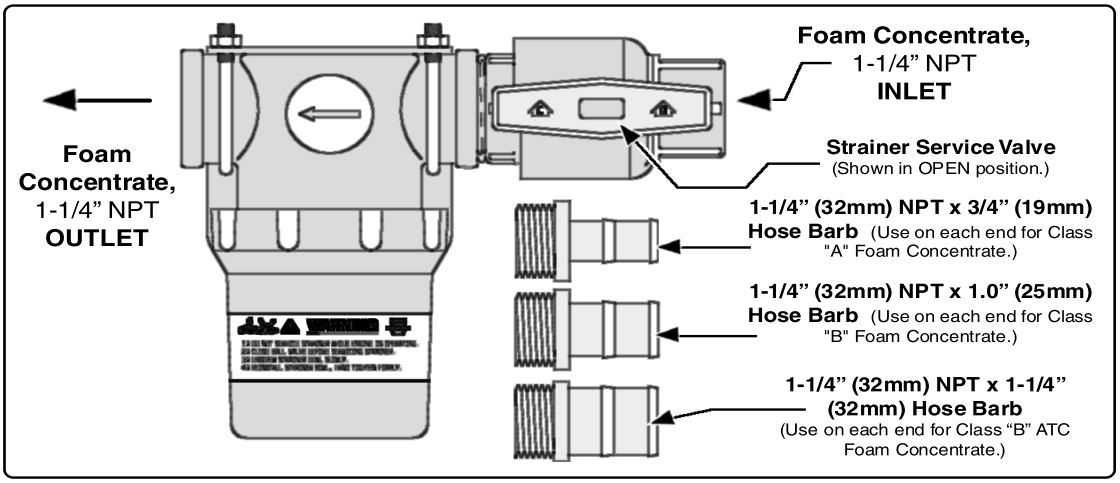


Figure 3-14: In-Line Strainer/Valve Installation

To Install the In-Line Strainer/Valve Assembly

1. Choose a location on the apparatus that allows gravity feed from the foam tank to the strainer inlet *and* from the strainer outlet to the foam pump suction connection.

Notes: When selecting the strainer location make sure there is sufficient space above and below the strainer.

- ❑ A minimum of 5" (127 mm) below for removal of the strainer basket and screen for cleaning
- ❑ 2" (51 mm) above to permit operation of the service valve

2. Mark 4 holes to mount the foam strainer bracket. Drill tapped holes for 1/4”-20 UNC screws (#7 drill for ¼-20 UNC tap)...or...drill clearance holes for 9/32” (7 mm) for 1/4”-20 UNC screws. (See Figure 3-15: “In-Line Strainer Mounting Bracket Layout.”)

3. Secure the bracket and strainer/valve assembly to the apparatus.

4. Select the appropriate fittings from the bag attached to the strainer assembly. Two of each fitting are included with the strainer assembly. For fitting selection vs. type of foam concentrate see Figure 3-14: “In-Line Strainer/Valve Installation.”

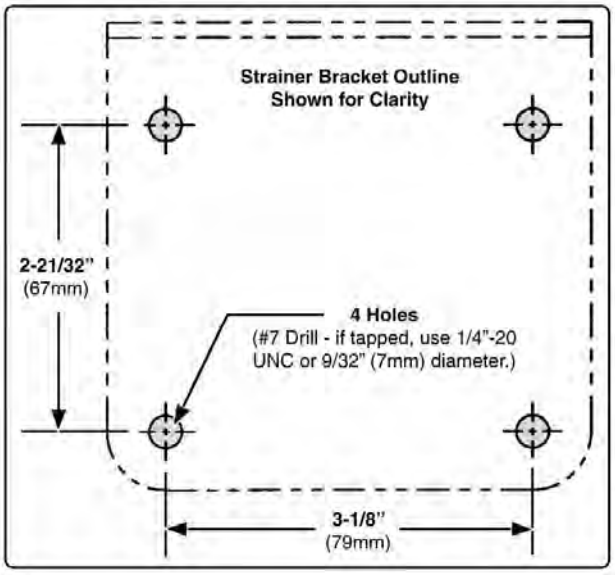


Figure 3-15: In-Line Strainer Mounting Bracket Layout

5. Coat all fitting threads with Permatex #80724 (or equal) plastic pipe thread sealant. Install the fittings into the strainer/valve assembly ends and tighten.

6. Install the clear plastic hose from the foam tank outlet to the inlet of the strainer/valve assembly. (See Figure 3-14: “In-Line Strainer/Valve Installation,” on page 67.) Wet the ends of the hose and fittings to make the installation easier.

CAUTION!

MAKE SURE THE FOAM TANK AND FOAM CONCENTRATE SUCTION HOSES ARE CLEAN BEFORE MAKING FINAL CONNECTION TO FOAM PUMP. IF NECESSARY FLUSH THE TANK AND HOSES PRIOR TO MAKING THE CONNECTION.

7. Install the clear plastic hose from the in-line strainer/valve assembly outlet to the inlet of the Hale MDT II, Hale MST, foam concentrate pump, or the correct fitting on Hale ADT.

FS Series Strainer

When a pressurized water flush is provided to the strainer from one of the discharges, Hale FS series strainers are required. The plumbing exposed to the flush water pressure must be rated at or above the operating pressure of all other discharge plumbing components (500 PSI/34 BAR minimum).

To Install FS Series Strainers

1. Choose a location on the apparatus that allows gravity feed from the foam tank to the strainer inlet and from the strainer outlet to the foam pump suction connection.

2. When selecting the strainer location make sure there is sufficient space behind the pump panel to attach hoses and fittings. Also make sure the inlet connection port is oriented correctly. (See Figure 3-16: “FS Strainer Orientation.”)

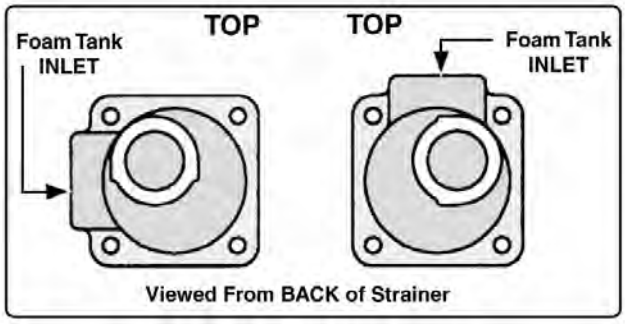


Figure 3-16: FS Strainer Orientation

3. Remove the strainer cap, mounting screws and nameplate from the strainer assembly.

4. Mark holes for mounting the foam strainer by using the nameplate as a guide, or see Figure 3-17: “FS Strainer Mounting Dimensions” on page 70.

5. Select the appropriate fittings to attach the hoses to the strainer. Two of each fitting are included with the strainer assembly. The fittings and hoses must be capable of withstanding the vacuum generated by the foam pump (23 inches [584 mm] Hg) and the maximum flushing water pressure (500 PSI [34 BAR]).

6. For FS-15 strainers use 3/4” (19mm) NPT x 3/4” hose fittings. For FS-25 strainers use 1” (25mm) NPT x 1” hose fittings.

7. Coat all fitting threads with a suitable thread sealant. DO NO USE Teflon Tape. Install the fittings into the strainer/valve assembly ends and tighten.

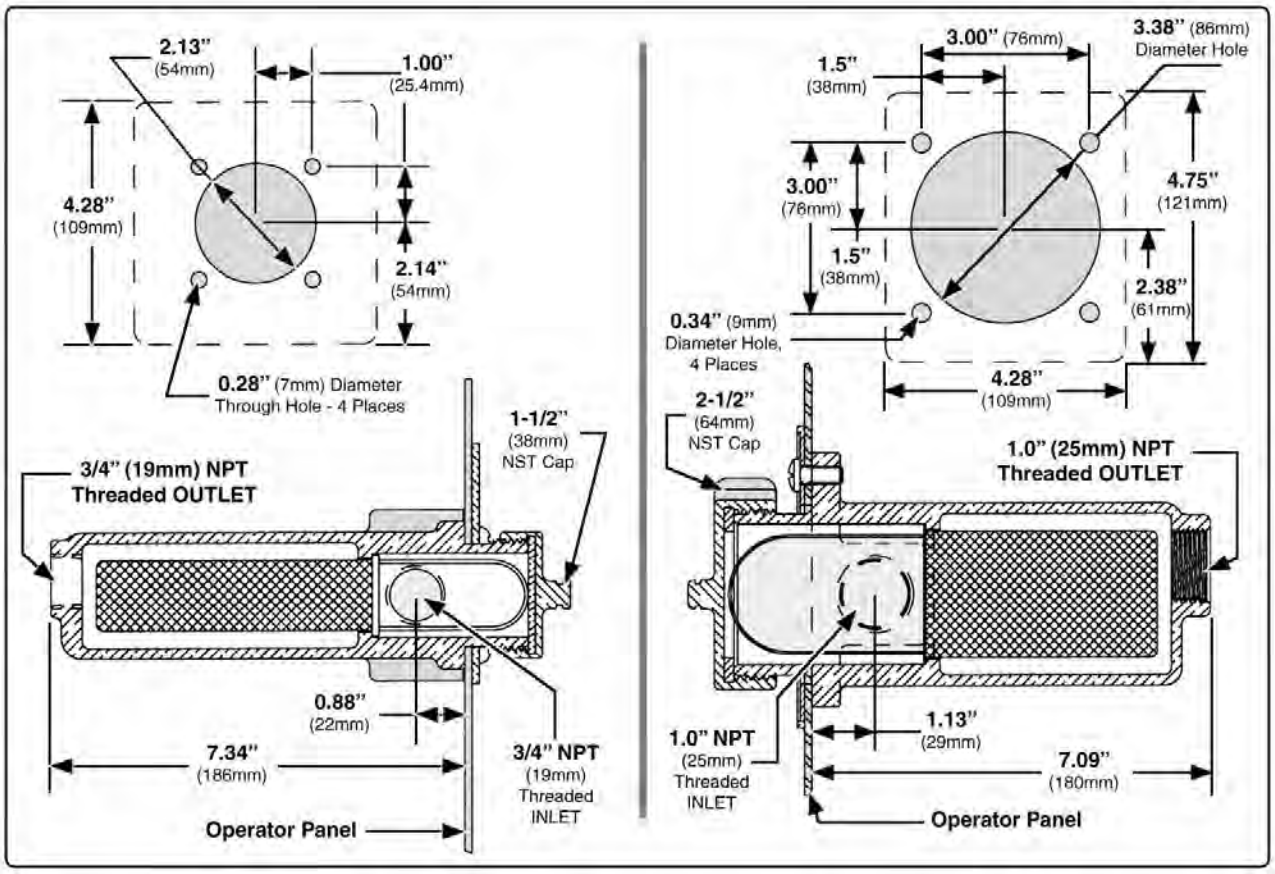


Figure 3-17: FS Strainer Mounting Dimensions

8. Make sure the strainer is properly oriented. (See Figure 3-16: "FS Strainer Orientation.") Apply Loctite #242 Threadlock Compound (or equal) to the screws, then secure the strainer body and nameplate to the apparatus. Install the strainer cap.

9. Install the clear plastic hose from the foam tank outlet to the inlet of the strainer. (See Figure 3-14: "In-Line Strainer/Valve Installation," on page 67.) Wet the ends of the hose and fittings to make the installation easier.

CAUTION !

MAKE SURE THE FOAM TANK AND FOAM CONCENTRATE SUCTION HOSES ARE CLEAN BEFORE MAKING FINAL CONNECTION TO FOAM PUMP. IF NECESSARY FLUSH TANK AND HOSES PRIOR TO MAKING CONNECTION.

10. Install the clear plastic hose from the strainer outlet to the inlet of the Hale FoamLogix foam pump, or the selector valve.

Check Valve / Injector Fitting

The Hale check valve/ injector fitting, supplied with the Hale FoamLogix system, meets NFPA requirements for a non-return device in the foam injection system. It prevents back flow of water into the foam concentrate tank.

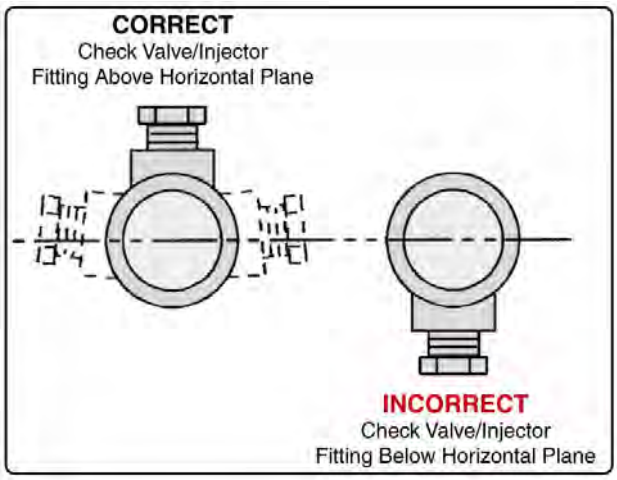


Figure 3-18: Check Valve/Injector Fitting Orientation

When properly installed the brass and stainless steel construction check valve/injector fitting ensures foam concentrate is injected into the center of the water flow for better mixing. (See Figure 3-18: "Check Valve/ Injector Fitting Orientation.")

Note: Always position the check valve/injector fitting at a horizontal or higher angle to allow water to drain away from the fitting. This avoids sediment deposits or the formation of an ice plug.

The check valve/injector fitting must be mounted in a location that is common to all discharges which require foam concentrate. (See Figure 3-19: "Check Valve / Injector Fitting Installation.")

The Hale FoamLogix system DOES NOT permit a separate injection point for each foam capable discharge.

The check valve/injector fitting has 1" NPT (25.4mm) threads on the outside, to fit into the 1" NPT threaded connection on the Hale mini manifold, a pipe tee, or a 1" NPT weld fitting installed in the discharge piping of the fire pump. (See Figure 3-19: "Check Valve / Injector Fitting Installation.")

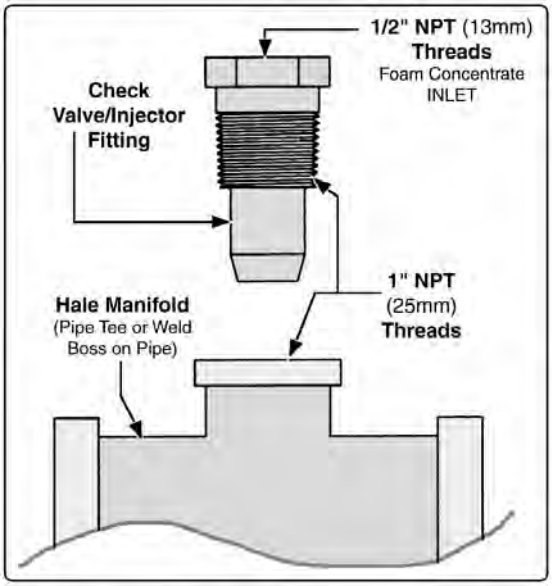


Figure 3-19: Check Valve / Injector Fitting Installation

The inlet connection of the check valve/injector fitting uses a 1/2" (13mm) NPT female threads.

Foam Concentrate Injection Hose

Connect a hose from the foam pump inject port to the inlet of the check valve injector fitting. (See Figure 3-20: “Injection and Bypass Hose Connections.”)

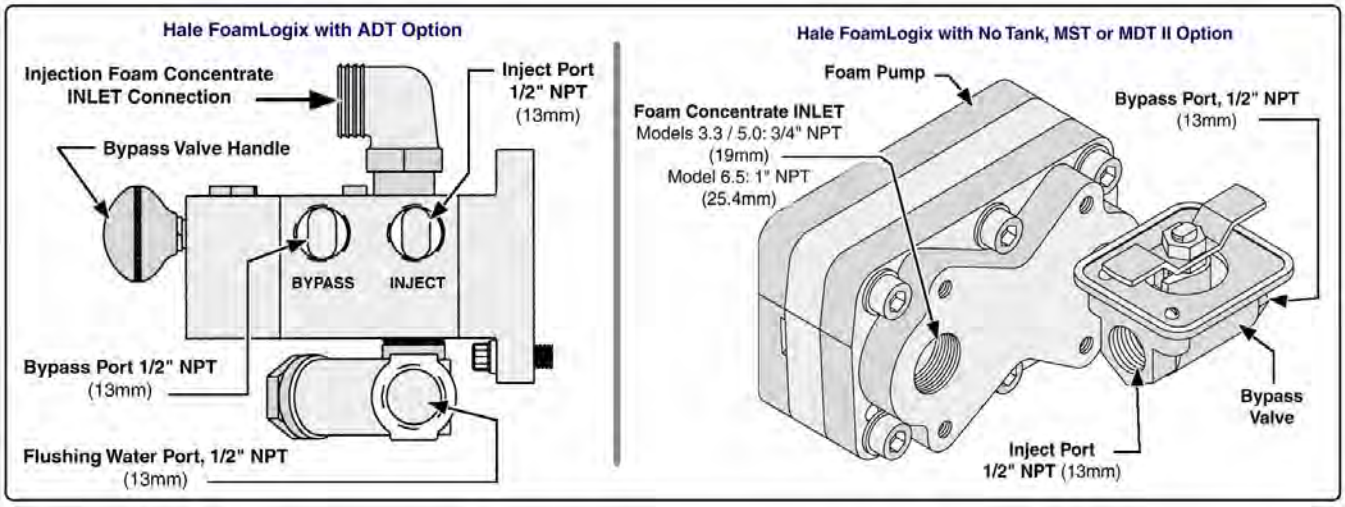


Figure 3-20: Injection and Bypass Hose Connections

The hose and fittings from the INJECT port to the check valve injector fitting should have a minimum 1/2” (13 mm) inside diameter and be rated at 500 PSI (34 BAR) working pressure (Aeroquip 2580-10 or equal).

Bypass Hose Connection

A bypass port is provided on the discharge side of the ADT, or a 1/4 turn bypass valve is mounted on the discharge of the foam pump when the ADT option is not installed. (See Figure 3-21: “Bypass Valve Assembly,” on page 73.)

The bypass handle must be accessible by the pump operator during normal operations. (See Figure 3-20: “Injection and Bypass Hose Connections.”)

The bypass is a 3-way directional valve. Determine which port is the INJECT port and which port is the BYPASS. (See Figure 3-21: “Bypass Valve Assembly,” on page 73.)

Bypass hose connections are 1/2” (13mm). Hose fittings compatible with all foam concentrates must be provided. The hose from the BYPASS port is plumbed to the atmosphere and should not receive HIGH pressure.

This hose is used for calibrating the foam pump, pumping the concentrate into a container to empty the foam tank or to assist in priming of the foam pump. The hose from the BYPASS port, must be long enough to reach a container outside the truck.

Note: If the handle or placard is removed from the bypass valve for repairs or to facilitate remote mounting make sure they are installed on the valve correctly. Make sure the tang on the handle engages the cast stops. (See Figure 3-21: “Bypass Valve Assembly.”)

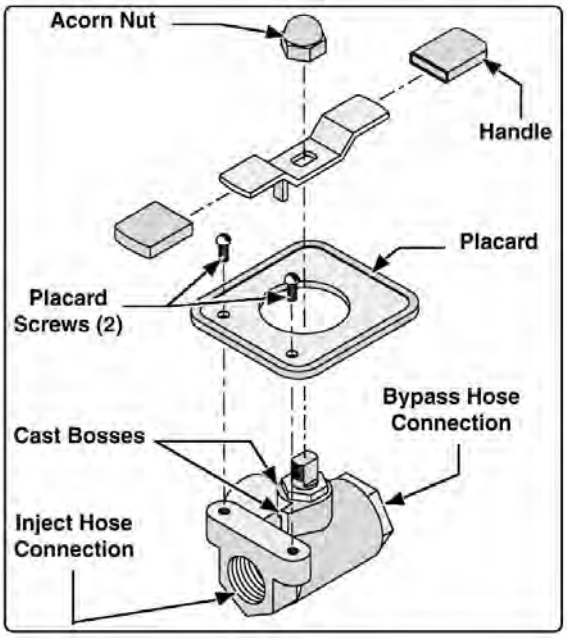


Figure 3-21: Bypass Valve Assembly

ADT Option Air Connections

If the ADT option is used, install the operating switch and indicator light placard on the apparatus operator panel. A mounting cutout diagram is provided. (See Figure 3-22: “ADT Option Panel Placard Layout Dimensions.”)

After mounting the placard assembly install the air hoses from the ADT to the placard assembly. Make sure proper connections are made at the placard assembly. (See Figure 3-23: “ADT Air Hose Connections, Part 1,” on page 74.)

A color coded decal attached to the ADT valve assembly along with an optional color coded air hose harness simplifies air hose connections. If the optional air hose harness is not used, 1/4” (6mm) inside diameter air brake tubing can be substituted. Make sure the air brake tubing selected has the proper DOT approval.

(See Figure 3-23: “ADT Air Hose Connections, Part 1,” on page 74.) Also see Figure 3-24: “ADT Option Air Hose Connections, Part 2” on page 75.

When cutting the air harness or air brake tubing to size make sure the ends are square using a tubing cutter or razor knife.

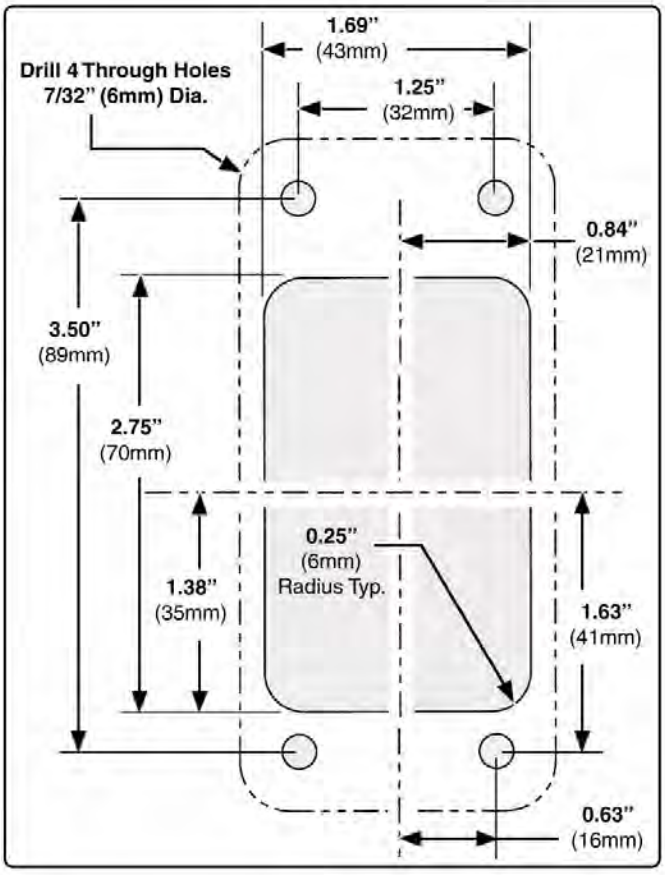


Figure 3-22: ADT Option Panel Placard Layout Dimensions

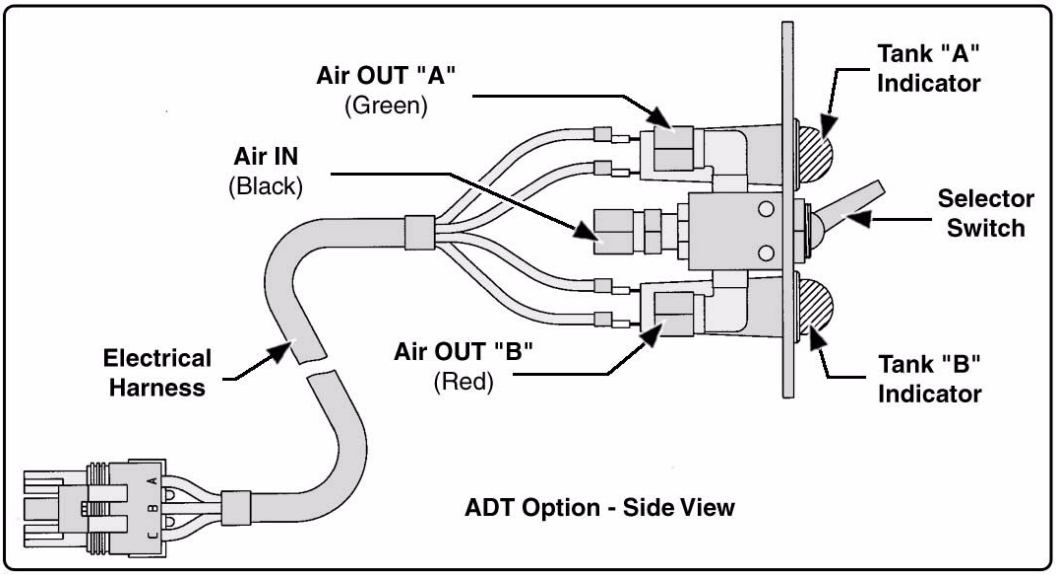


Figure 3-23: ADT Air Hose Connections, Part 1

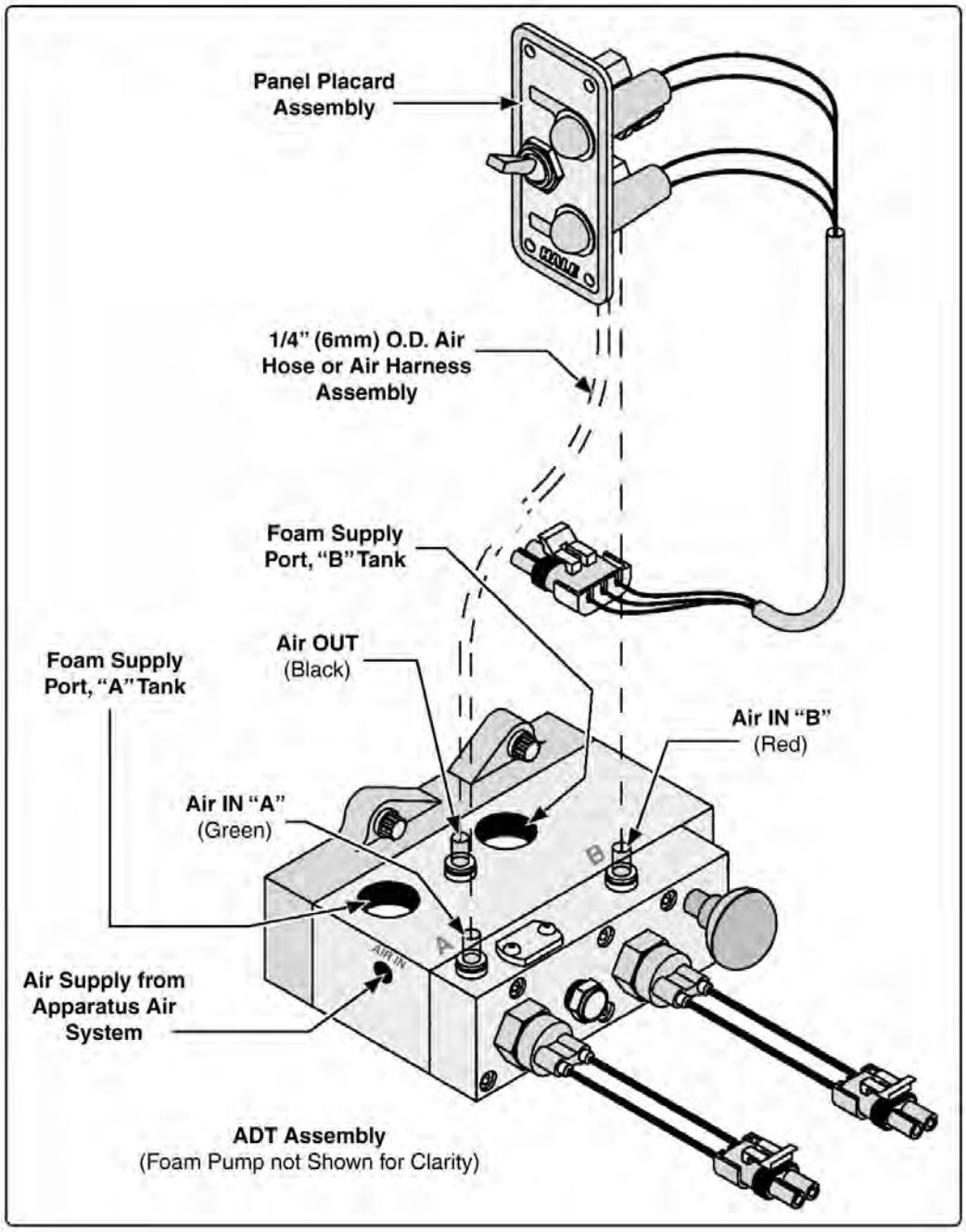


Figure 3-24: ADT Option Air Hose Connections, Part 2

Notes

3.5 SYSTEM PLUMBING DIAGRAMS

The following pages contain sample Hale FoamLogix system plumbing diagrams for various system configurations. Due to variations in apparatus configuration and individual component locations, the lengths of hoses and piping is not provided. The material described and component sizes shown provide optimum performance for a Hale FoamLogix system.

These diagrams are intended as guidelines to assist the system installer with the selection of hoses and fittings along with the connections required.

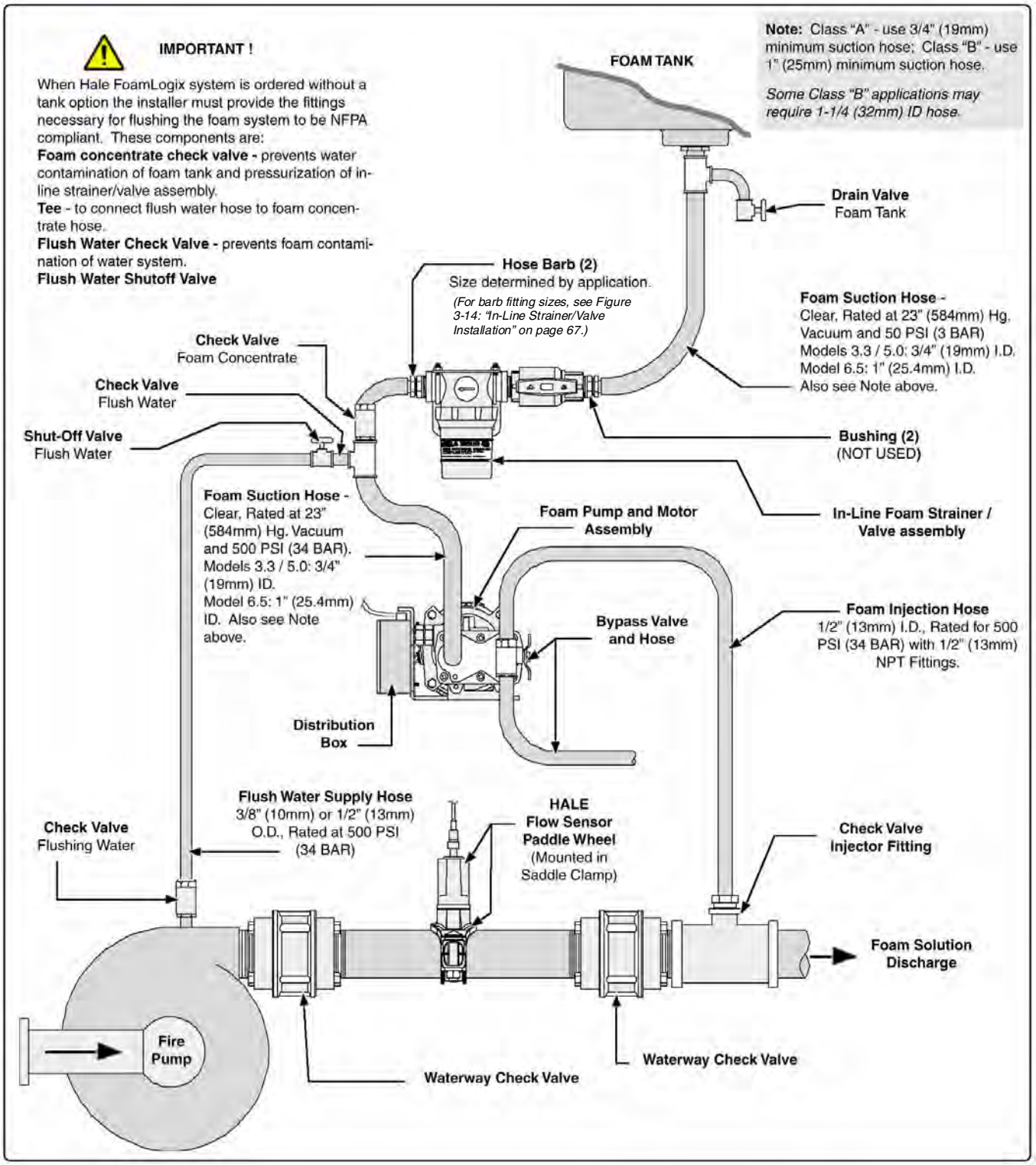


Figure 3-25: Typical Single Foam Concentrate Tank

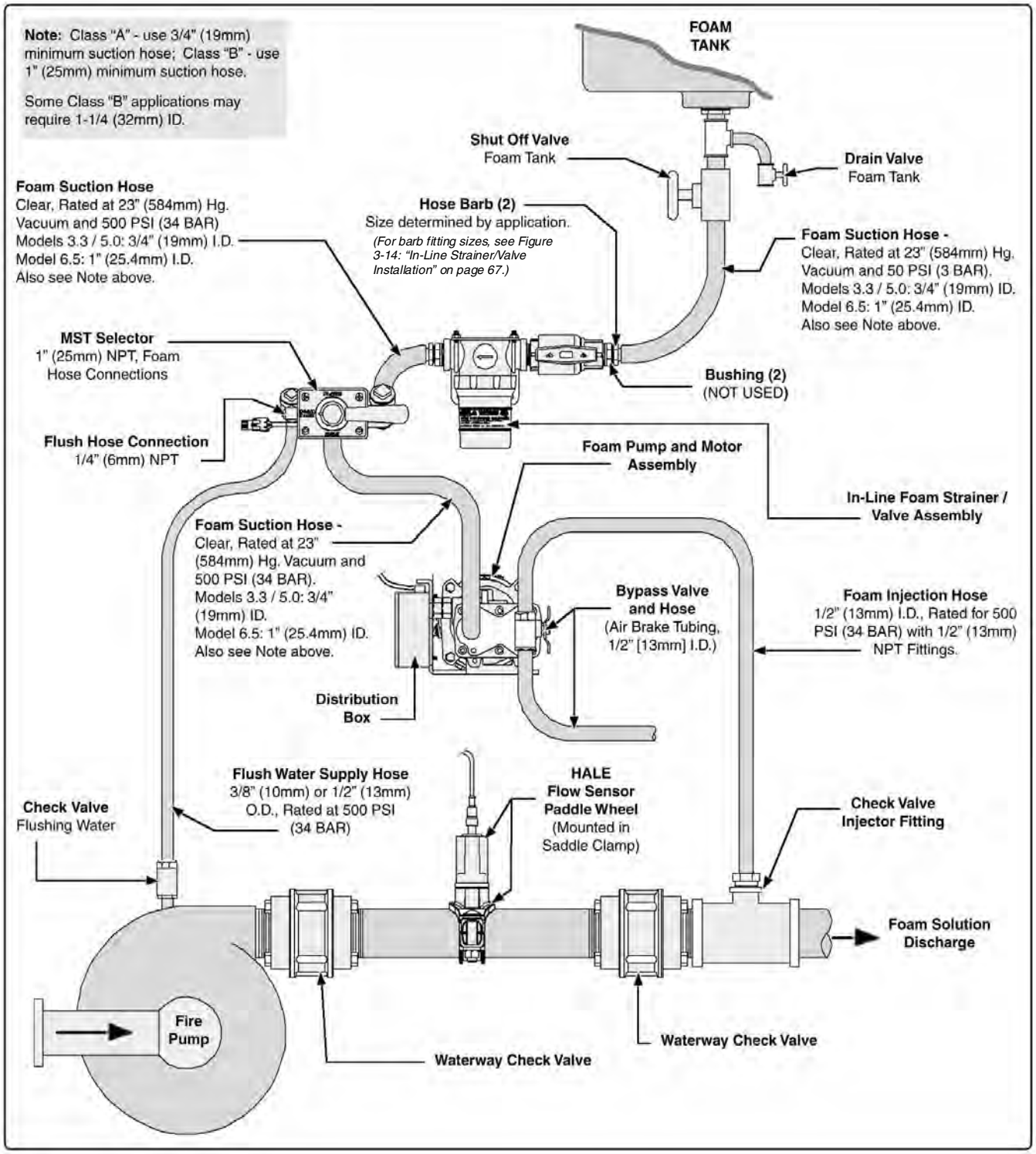


Figure 3-26: Typical Single Foam Tank with MST and In-Line Strainer/Valve Assembly

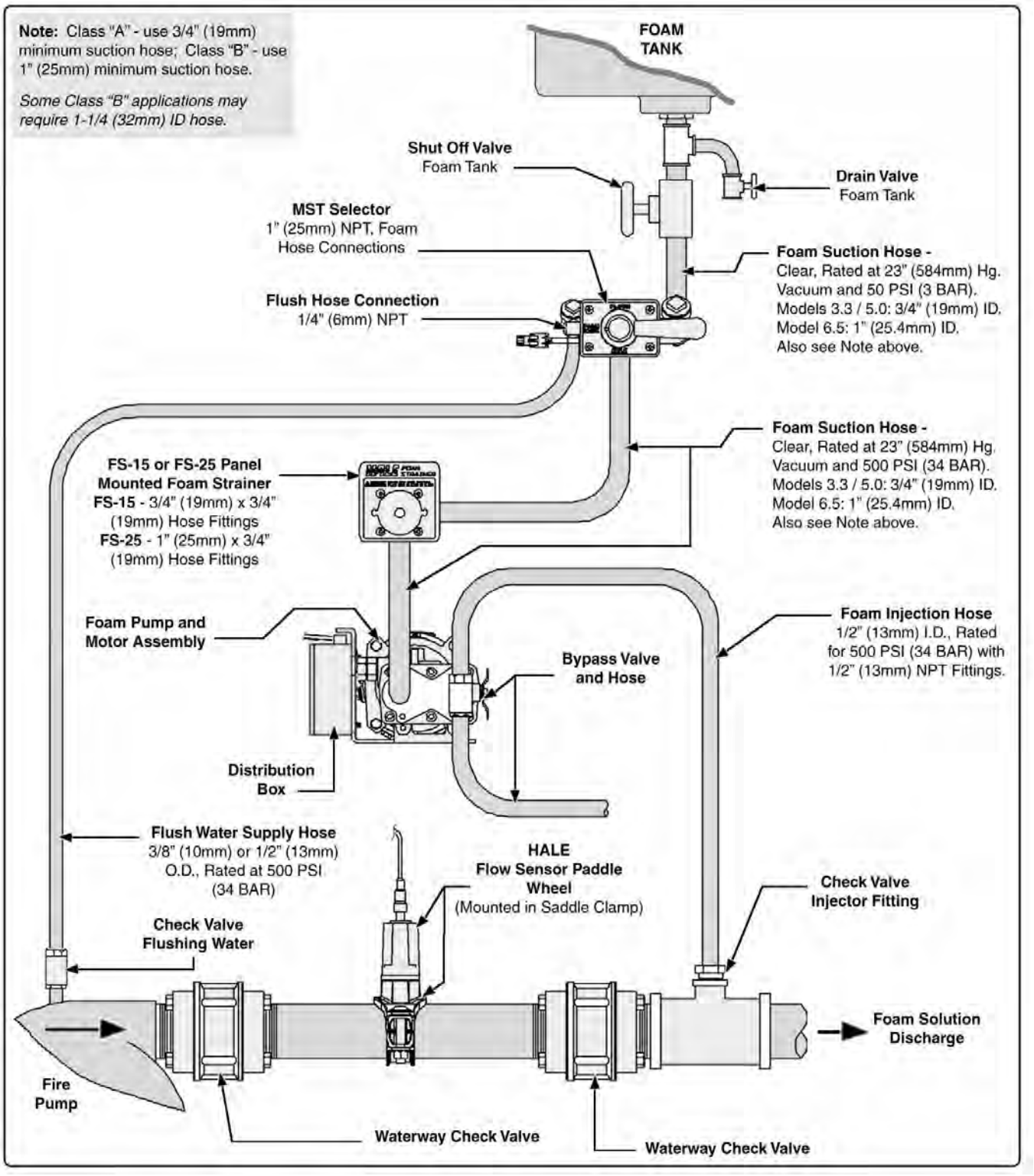


Figure 3-27: Typical Single Foam Tank, with MST and FS Series Strainers

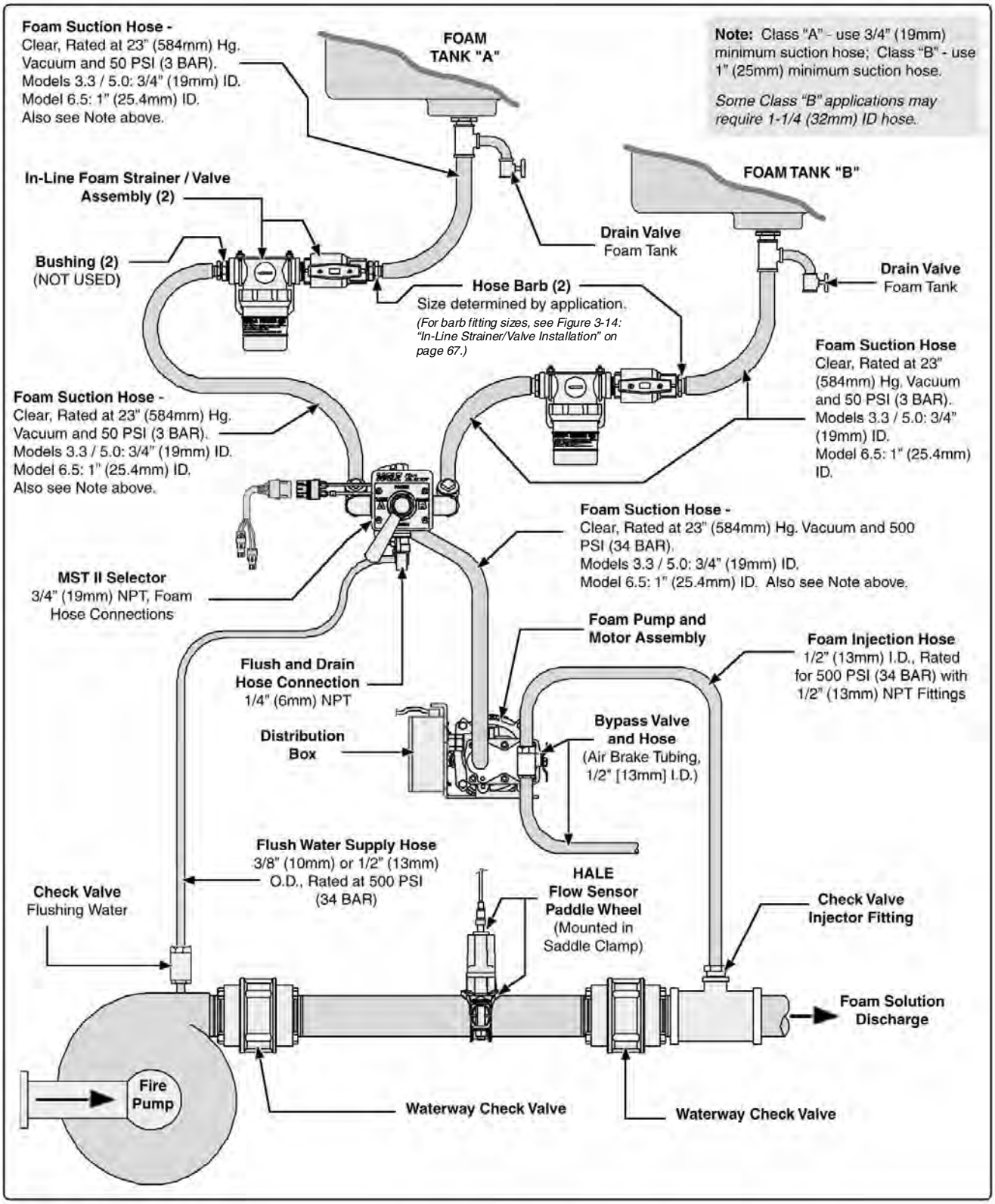


Figure 3-28: Single Foam Tank with MST II and In-Line Strainer/Valve Assembly

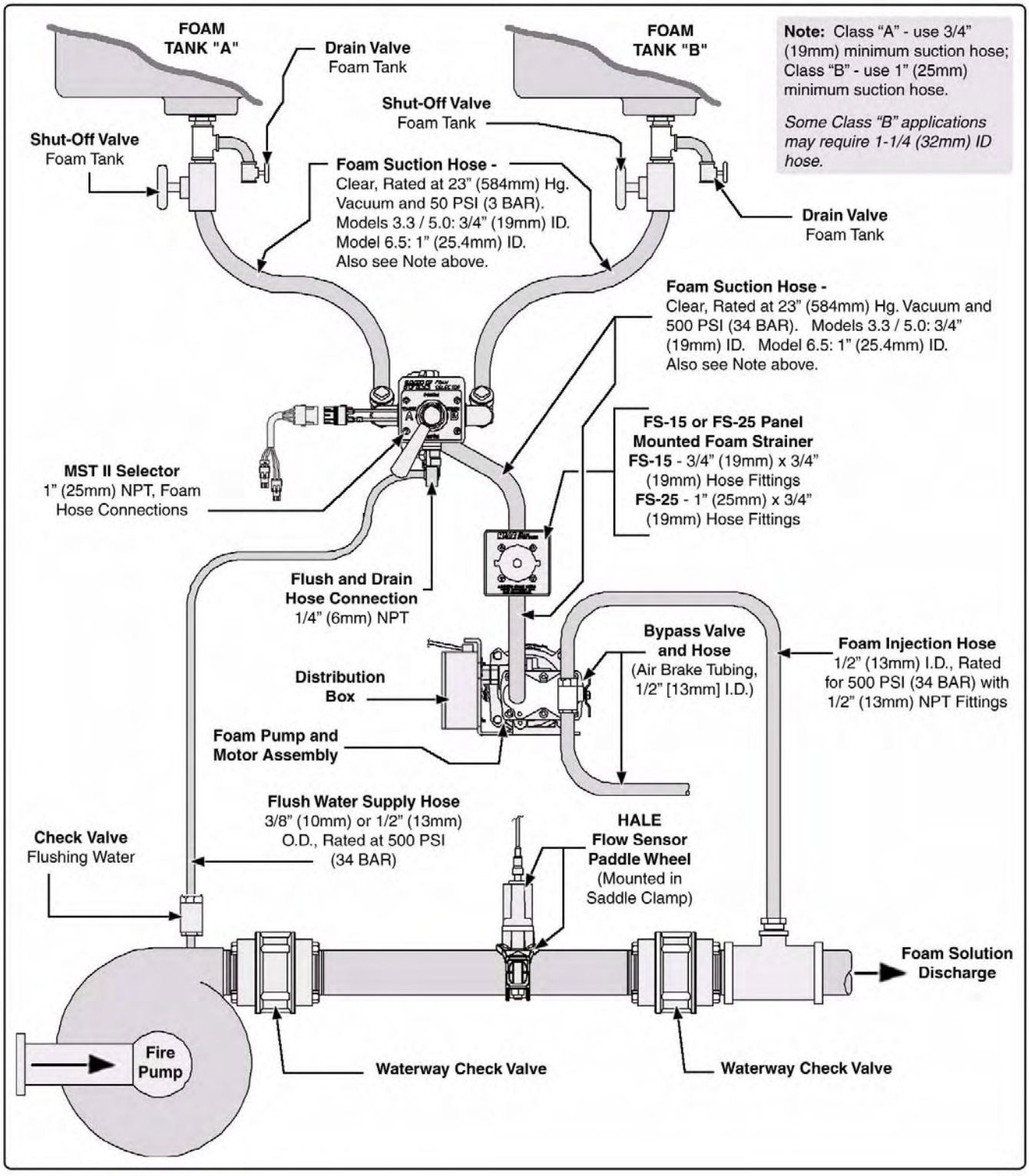


Figure 3-29: Typical Single Foam Tank with MST II and FS Series Strainers

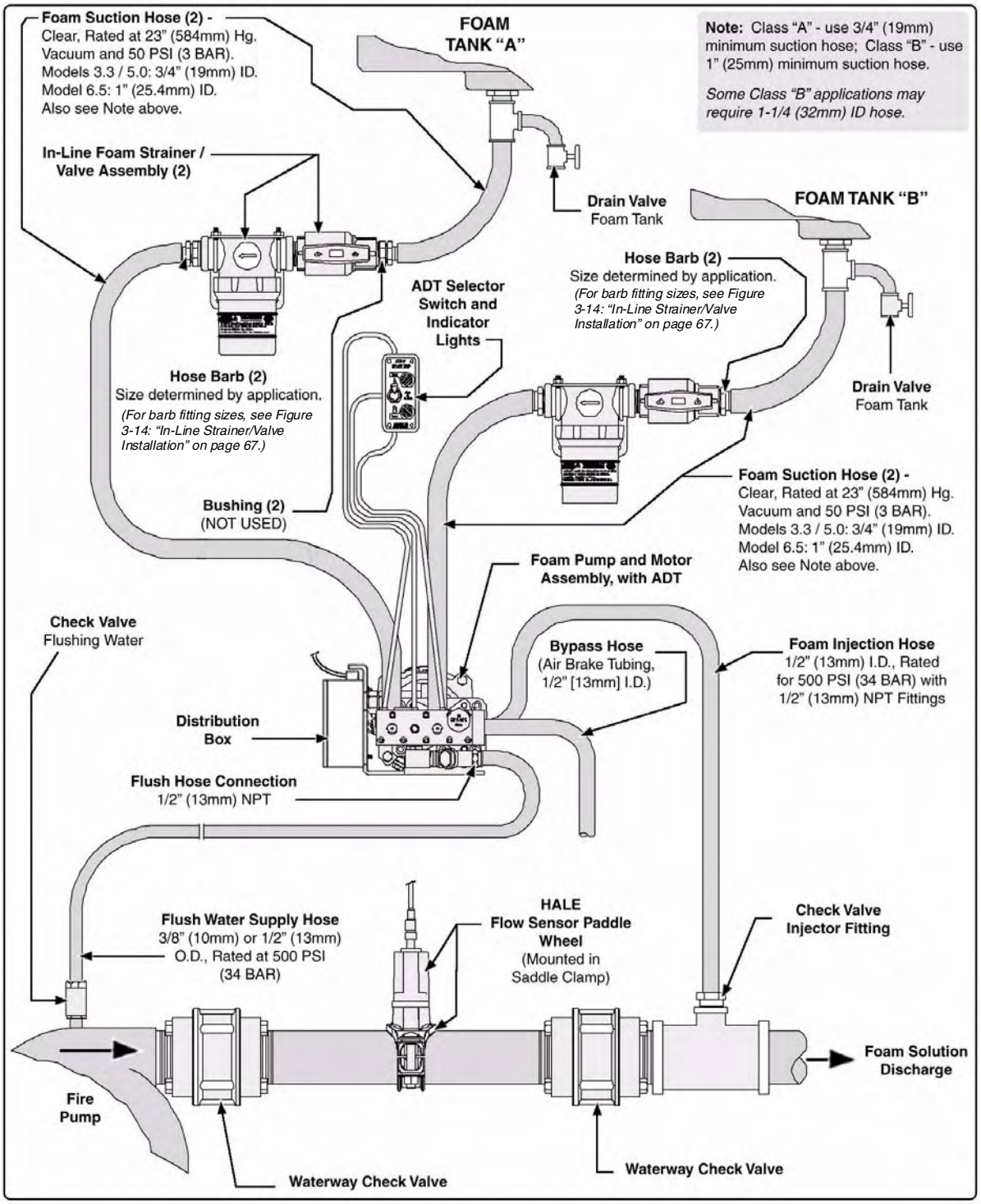


Figure 3-30: Typical Single Foam Tank with ADT and In-Line Strainer/Valve Assemblies

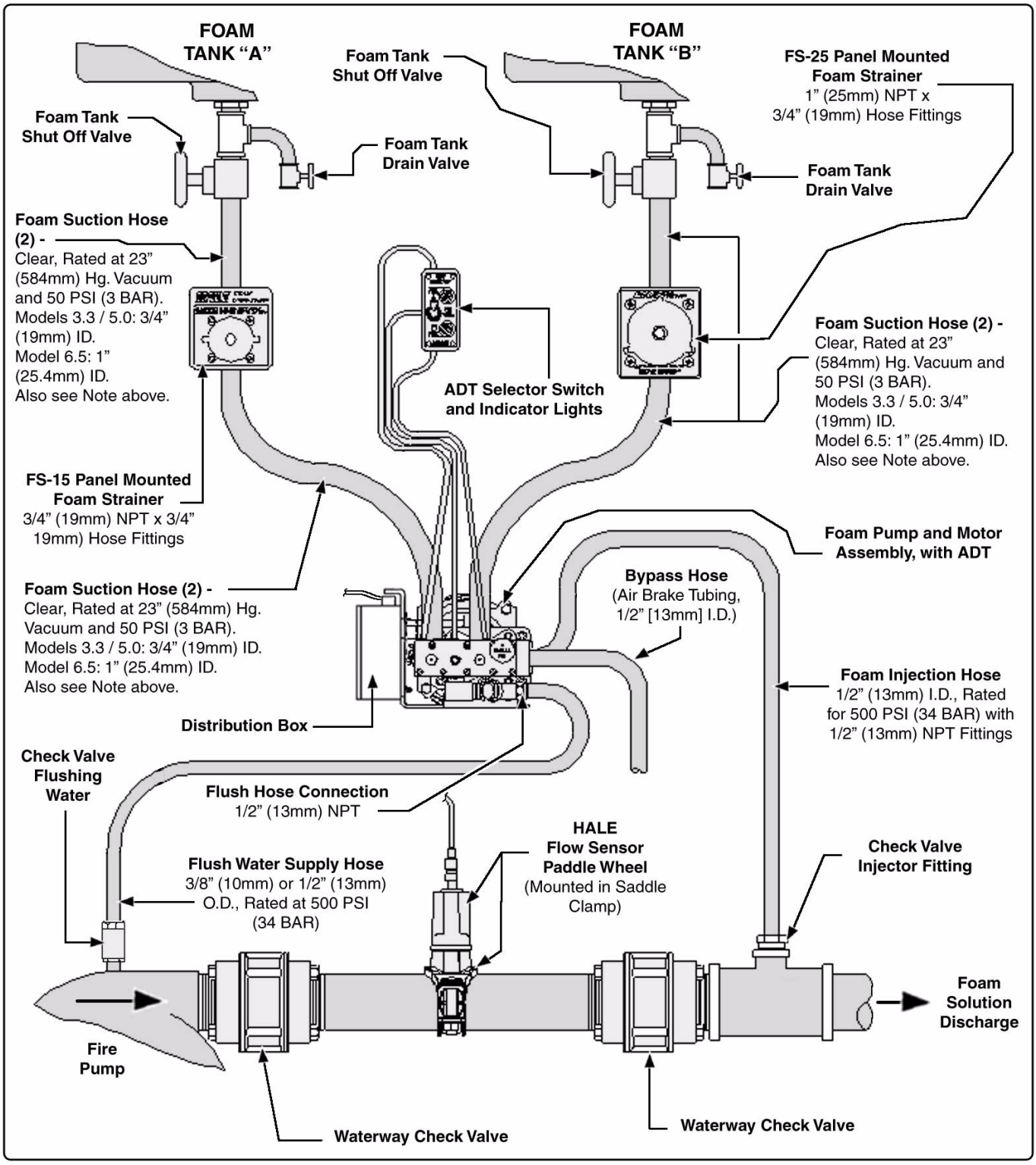


Figure 3-31: Typical Dual Foam Tanks, with ADT and FS Series Strainer Assemblies

3.6 ELECTRICAL

See Figure 3-32: “Single Tank Electrical Harness Overview,” on page 87. Also see Figure 3-33: “Dual Tank Electrical Harness Overview” on page 88.

Complete system electrical diagrams are provided at the end of this manual. Refer to these diagrams for proper installation of each of the electrical components.

The Hale FoamLogix 3.3, 5.0 or 6.5 system is designed to be installed with a minimum of electrical connections. Cables are provided with each Hale FoamLogix system to make the flow sensor, control unit and motor distribution box connections.

The system installer must supply primary power wire, low tank level sensor wire and flat braided ground straps.

CAUTION !

- **Review the “Safety” section of this manual, beginning on page 13, in its entirety before proceeding with electrical connections.**
- **To prevent system damage or electrical shock the main power supply wire must be the last connection made to the Hale FoamLogix motor distribution box. Also see heading “Hale Foam System Layout Drawings” on page 39.**
- **The cables provided with each Hale FoamLogix system contain shielded assemblies.**

  NEVER attempt to shorten or lengthen these shielded cables.

  If necessary order longer or shorter cables from Hale Products to suit your particular installation.
- **The cables are indexed so they connect to the correct receptacle one way only. The cables shipped with each Hale FoamLogix system are tested at the factory with the specific unit. When making cable connections DO NOT force mismatched connections as damage can result, causing improper system operation.**
- **The system can only perform when electrical connections are sound.**

  Make sure each electrical connection is correct.
- **Hale FoamLogix systems are designed for use on direct current, negative (–) ground apparatus electrical systems only.**
- **Do not mount a radio transmitter or transmitter cables in direct or close contact with the Hale FoamLogix unit.**

CAUTION ! - continued



- ❑ **Before connecting the cables, inspect the O-ring seal in the female connector. If the seal washer is missing or damaged, water can enter the connector causing corrosio, resulting in possible system failure.**
- ❑ **The ground strap must be a minimum of 1-1/4" (32mm) wide and no longer than 18" (457mm).**

  A longer ground strap must be wider or a double thickness strap must be used.

  Make sure the ground strap is attached to the chassis frame. Grounding to the body IS NOT acceptable.
- ❑ **Always disconnect the power cable, ground straps, electrical wires and cables from the control unit or other Hale FoamLogix equipment before electric arc welding at any point on the apparatus.**

  Failure to do so could result in a power surge through the unit that could cause irreparable damage.
- ❑ **There are no user serviceable parts inside Hale FoamLogix system electrical/electronic components. Opening of these components (motor distribution box or control unit) voids the warranty.**

Single and Dual Tank Electrical Harness Overview

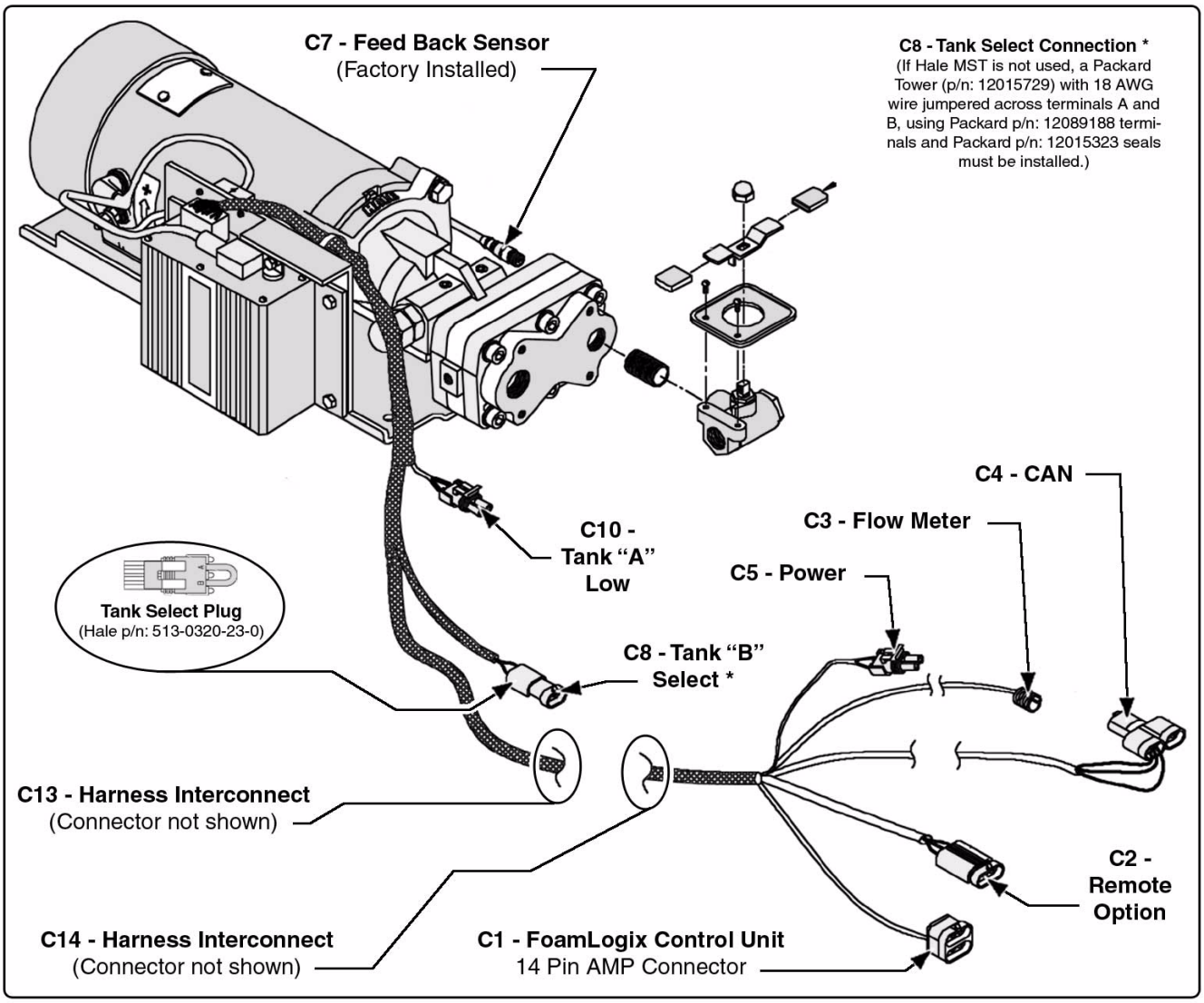


Figure 3-32: Single Tank Electrical Harness Overview

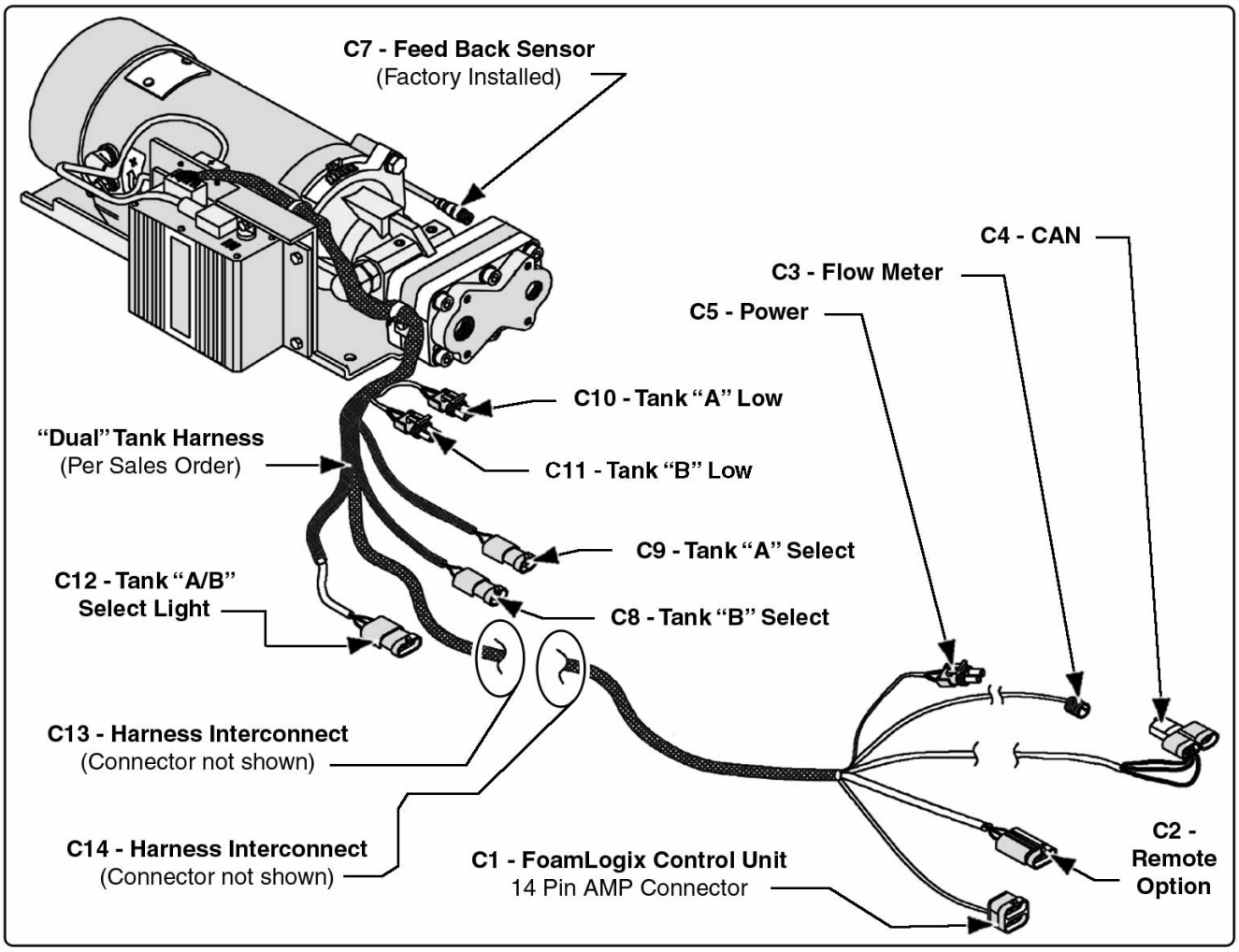


Figure 3-33: Dual Tank Electrical Harness Overview

Control / Display Unit

The control/display unit mounts in the operator panel of the apparatus. The display is secured with four #10 socket head screws. (See Figure 3-34: "Control/Display Unit Mounting Dimensions" on page 89.)

The display requires a 7.00" (178mm) minimum clearance from the back of the operator panel to allow proper cable connection. Once the control unit is mounted on the operator panel, attach the 14 pin AMP connector on the cable assembly to the back of the display. For harness overview, see Section 8 " Drawing Package," on page 155. Also see Figure 3-35: "Distribution Box Connections" on page 90.

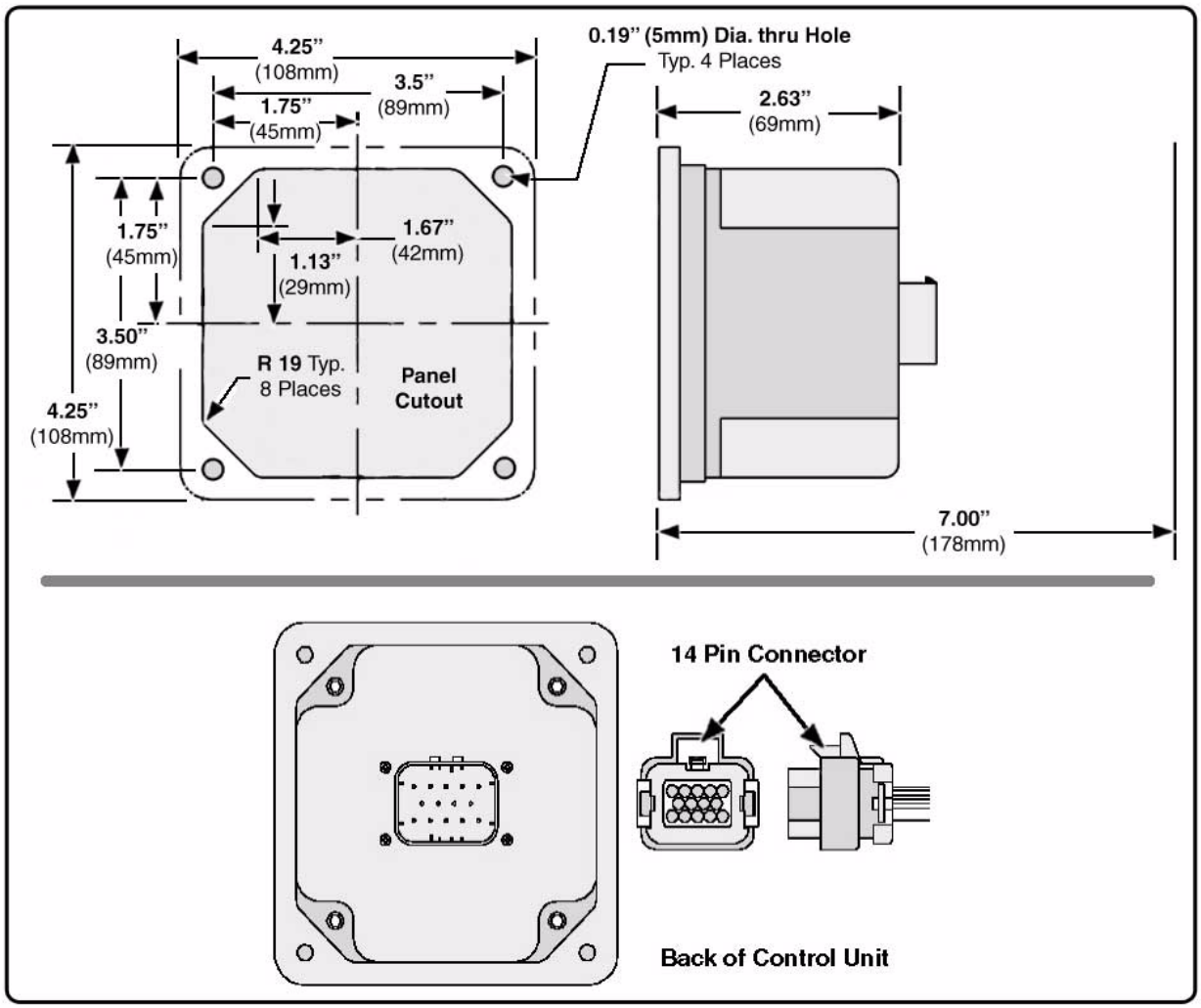


Figure 3-34: Control/Display Unit Mounting Dimensions

Notes: Ensure that the panel where the control unit is mounted has an adequate ground. For stainless steel and vinyl coated panels a ground strap, 1/2" (13mm) wide, must be attached from one of the four screws securing the control unit in place to the frame of the fire truck to ensure adequate grounding.

Add a service loop to avoid strain on the wires or connectors during body and frame flex. Also see Figure 3-36: "Extra Cable Storage" on page 92.

Control / Display Unit Connection

The main control cable harness connects to the 14-pin AMP connector or pigtail on the back of the control unit. For harness overview, see Section 8 " Drawing Package," on page 155. Also see Figure 3-34: "Control/Display Unit Mounting Dimensions" on page 89.

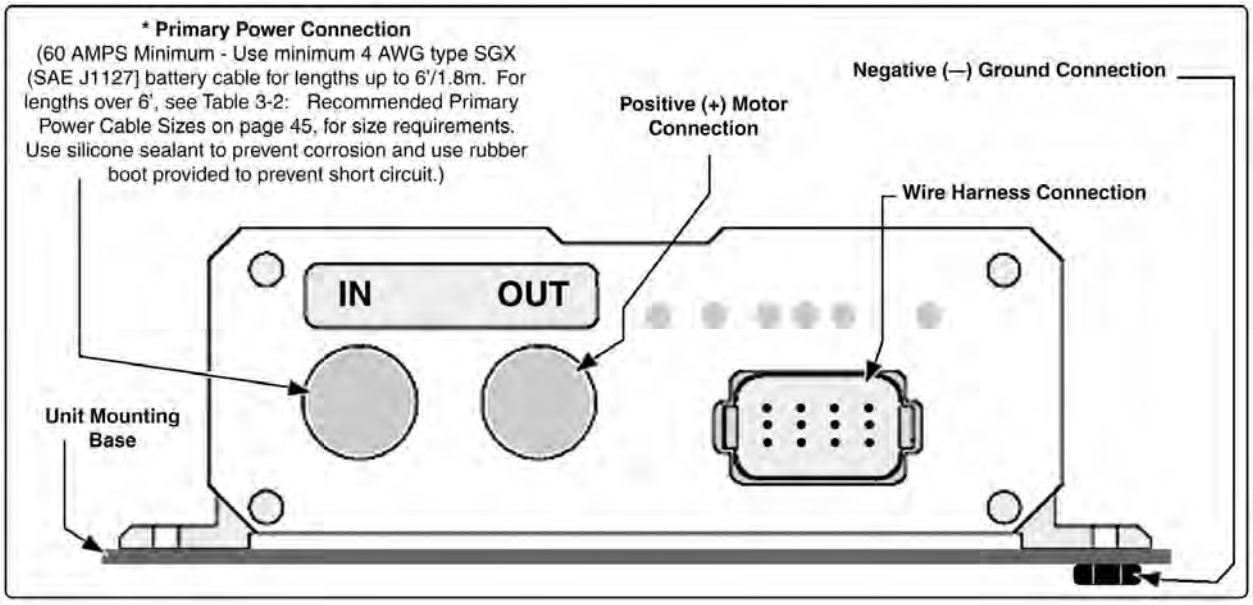


Figure 3-35: Distribution Box Connections

Distribution Box Ground / Primary Power

CAUTION !

CONNECT THE PRIMARY POSITIVE LEAD FROM THE TERMINAL BLOCK TO THE MASTER SWITCH TERMINAL OR RELAY TERMINAL USING MINIMUM 4 AWG TYPE SGX (SAE J1127), CHEMICAL RESISTANT, BATTERY CABLE AND PROTECT WITH WIRE LOOM.

PREVENT CORROSION OF POWER AND GROUND CONNECTIONS BY SEALING THESE CONNECTIONS WITH THE SILICONE SEALANT PROVIDED.

Ground Connection

Be sure the Hale FoamLogix system is grounded to the chassis. Use a short length of wide flat ground strap, at least 1-1/4" (32mm) wide and less than 18" (457 mm) long, to reduce the potential of RFI emitted by this connection.

A stud is located on the mounting base, labeled **NEG (-),** to attach the chassis ground strap to the Hale FoamLogix system. (See Figure 3-35: "Distribution Box Connections" on page 90.)

When making the ground strap connections make sure lugs are soldered to the strap ends for trouble free connections. Seal all connection against corrosion. When the length of the ground strap exceeds 18" (457mm) use a wider strap or a double thick strap.



CAUTION !

DO NOT CONNECT THE MAIN POWER LEAD TO SMALL LEADS THAT ARE SUPPLYING SOME OTHER DEVICE, SUCH AS A LIGHT BAR OR SIREN. THE HALE FOAMLOGIX MODELS 3.3, 5.0 AND 6.5 REQUIRE 60 AMP MINIMUM CURRENT.

Primary Power Supply Connection

Make sure adequate switched electrical power from the battery + terminal to the battery connection stud on the motor distribution box is provided. (See Table 3-2: "Primary Power Cable Sizes" on page 55.)

Use 4 AWG minimum type SGX (SAE J1127) battery cable directly to the battery, battery switch or solenoids for cable runs up to 6' (1.8 meters) long. Longer wire runs may require larger battery cable for proper operation. DO NOT connect power to the same connection as the pump primer.

Display Power Connection

Use 16 AWG minimum type SGX (SAE J1127) wire for the display power and ground connections. Using the harness provided, Hale p/n: 513-0270-04-4:

- ❑ Connect the **BLACK** wire to a chassis ground stud
- ❑ Connect the **RED** wire to a minimum 5 AMP fused dedicated circuit. If a dedicated circuit is not available, connect to a terminal that has LOW current load items, such as ENFO IV, governor and tank level gauge, etc.
- ❑ Connect this harness to connector **C5** on the FoamLogix main harness.

RFI / EMI

A 100% electrically shielded main cable harness is provided with the Hale FoamLogix system to eliminate the potential problem of RFI / EMI.

Proper installation of system components and cables, along with proper grounding, limits radio interference caused by the Hale FoamLogix system. Additionally, make sure radio cables and hardware are not located in the immediate area where the FoamLogix system is mounted.

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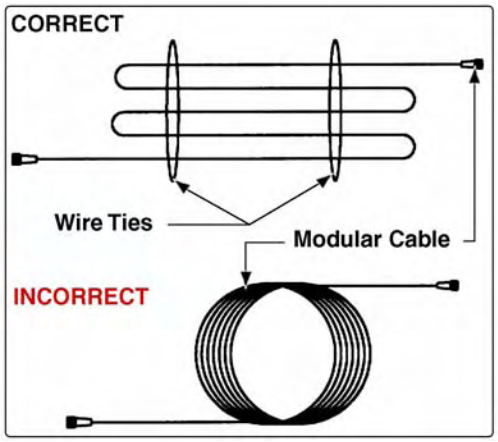


Figure 3-36: Extra Cable Storage

Making round coils of extra control and flow sensor cables in the pump compartment can act as an antenna. While the control and flow sensor cables cannot be shortened, various lengths of cable are available to minimize the "extra" cable in the apparatus.

When routing control and flow sensor cables take care to avoid routing them next to antenna wires, radio power lines and radio components. When there is extra cable, double the cable back on itself and secure with plastic wire ties in a flat bundle instead of making a round coil. (See Figure 3-36: "Extra Cable Storage.")

Make sure the flow sensor tee is grounded. If metal piping is used sufficient grounding may be present. However, Victaulic joints, plastic pipe and rubber mounted pumps interfere with proper grounding and an additional ground strap may be required. If necessary, connect a flat braided ground strap at least 1/4" (7mm) wide from the flow sensor tee to the apparatus frame to ensure proper grounding.

The #6-32 UNC screw that holds the spade terminal to the flow sensor tee can be used to attach the ground strap to the tee. (See Figure 3-13: "Flow Sensor/Saddle Clamp Installation" on page 65.)

Flow Sensor Connections

The control cable harness (connector C3) connects to the 3-pin connector on the flow sensor. For cable harness overviews, see Section 9 " 9 Plate Drawings," on page 170.

"Low Level Sensor" Installation (Foam Tank)

The foam low tank level sensor(s) must be installed and wired to monitor the foam concentrate level. (See Figure 3-37: "Low Level Sensor Mounting Options" on page 93.)

CAUTION !

FOAM TANK LOW LEVEL SENSORS MUST BE USED TO PROTECT THE HALE FOAMLOGIX FROM DRY RUNNING. FAILURE TO USE LOW LEVEL SENSORS WITH THE HALE FOAMLOGIX SYSTEM VOIDS THE WARRANTY.

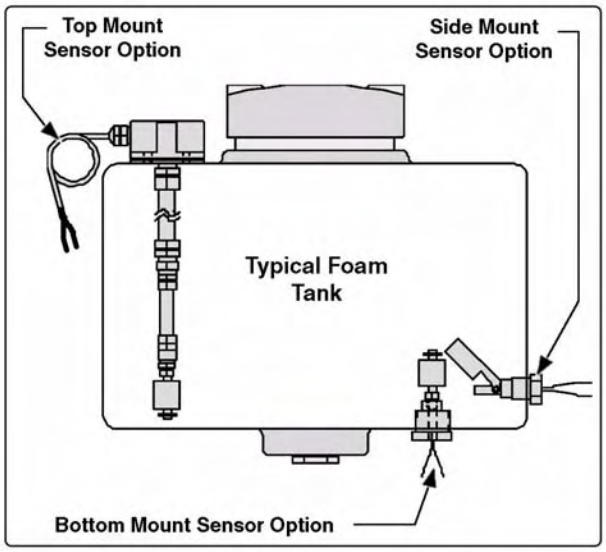


Figure 3-37: Low Level Sensor Mounting Options

Side Mount Installation

A side mount low tank level sensor is used if the bottom of the foam tank is not accessible.

1. The sensor has 1/2" (13mm) NPT threads. If tank design and construction allows, the side mount sensor is threaded directly into the side of the tank at the proper height. (See Figure 3-38: "Side Mount Sensor Location Dimensions.")

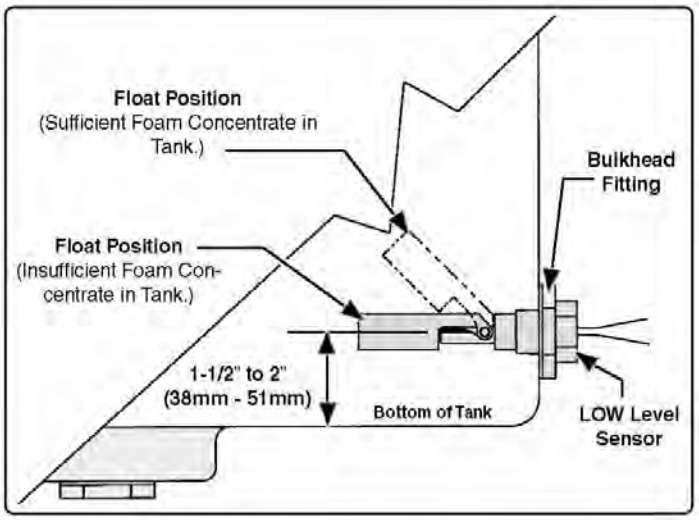


Figure 3-38: Side Mount Sensor Location Dimensions

Also, the sensor can be mounted on the foam tank using a 1/2" x 1" (13 x 25mm) NPT bushing and a bulkhead fitting with 1" (25mm) FNPT threads.

2. The center of the switch must be located at least 1-½ to 2 inches (38 to 51 mm) from the bottom of the foam tank with the float positioned on top of the switch to allow up and down movement.

Note: When the side mount low level sensor senses a low concentrate condition the system operates for an additional one minute unless the foam concentrate level is restored. If the foam concentrate level is not restored the system SHUTS DOWN. When locating the side mount low tank level sensor on the tank sufficient foam concentrate should be present for one minute of operation at the rated flow.

3. Coat the threads of the sensor with a suitable sealant and insert into tank fitting. Tighten sensor making sure the float is on the top of the sensor. (See Figure 3-37: “Low Level Sensor Mounting Options” on page 93.)

4. After installation, check operation of the side mount low tank level sensor with a powered test light. With no foam in the tank, the light should be ON. If light does not illuminate, rotate the side mount low tank level sensor until the test light is ON.

Bottom Mount Installation

The bottom mount foam tank low level sensor must be mounted into the bottom of the foam tank. (See Figure 3-37: “Low Level Sensor Mounting Options” on page 93.)

1. The sensor, as supplied, is threaded into a bushing (1” [25mm] NPT threads) and is designed to be installed from the outside of the foam tank through a bulkhead fitting or boss with 1” (25mm) FNPT threads.

2. Mount the sensor in the bottom of the foam tank in an upright position. Use a suitable sealant to prevent concentrate leakage. (See Figure 3-37: “Low Level Sensor Mounting Options” on page 93.)

3. Check low tank level sensor operation with a powered test light. With no foam in the tank, the light should be ON.

4. If not, remove the clip from the end of the sensor. Remove float and reinstall 180° out of position. Re-install clip.

Top Mount Installation

The top mount low level sensor assembly is available for installations where the sides or bottom of the foam tank are not accessible or sensor service is required without draining the foam tank.

The sensor assembly is flange mounted in an access hole at the top of the foam tank. The two section telescoping assembly permits adjustment of the low tank level sensor position for various foam tank depths, from 31- 1/2” to 60” (800mm to 1,524mm). (See Figure 3-39: “Top Mount Sensor Dimensions” on page 95.)

Flange cutout dimensions are shown in Figure 3-39: "Top Mount Sensor Dimensions." The flange gasket can also be used as a template to mark hole location.

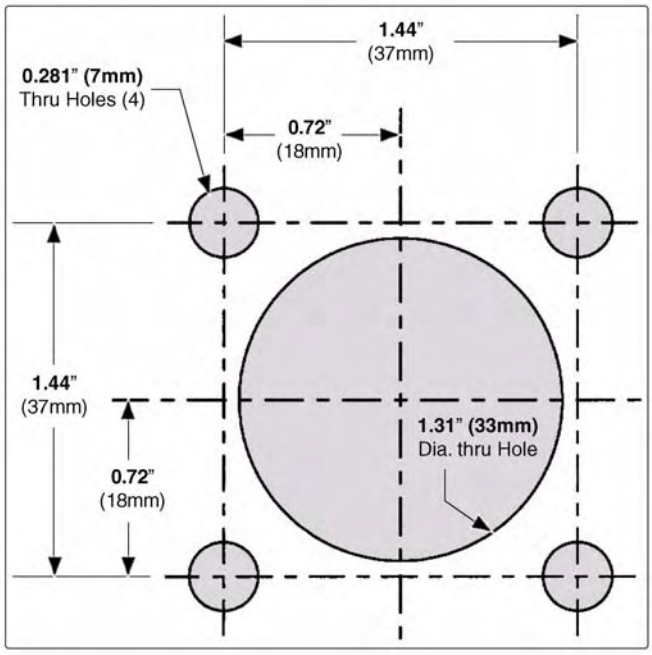


Figure 3-39: Top Mount Sensor Dimensions

1. Layout and drill holes in the top of the foam tank. (See Figure 3-39: "Top Mount Sensor Dimensions.")

2. The center of the sensor should be located at least 1-1/2" to 2" (38 to 51mm) from the sides of the foam tank.

Note: The minimum depth of the foam tank for installation of the top mount sensor is 31-1/2" (800mm). If the tank depth is less than 31-1/2" (800mm) cut the tubing accordingly. (See heading "Resizing the Top Mount Low Level Sensor" on page 96.)

3. Determine the approximate length of the low tank sensor extension by measuring from the top of the foam tank at the flange opening to the bottom of the tank.

4. When properly installed the center of the sensor float should be 1-1/2" to 2" (38 to 51mm) above the bottom of the foam tank.

5. Loosen the strain relief gland nut to allow the sensor wire to slide through the strain relief.

6. Adjust the telescoping section until the desired length is achieved as measured from the bottom of the flange to the bottom of the sensor. Tighten the compression fittings on the union to lock length setting.

7. Tighten the strain relief around the sensor wire.

8. Insert the sensor assembly through the 1.31" (33mm) hole and align the screw holes on the flange and gasket with the holes on the tank. Secure the assembly in place using four 1/4-20 UNC x 1" (25mm) long cap screws, 1/4" (7mm) washers and lock washers.

CAUTION !



USE MOUNTING HARDWARE THAT IS COMPATIBLE WITH ALL FOAM CONCENTRATES BEING USED IN THE SYSTEM. USE WASHERS, LOCK WASHERS AND CAP SCREWS MADE OF BRASS OR 300 SERIES STAINLESS STEEL.

Resizing the Top Mount Low Level Sensor

Certain applications may require the top mounted sensor to be shorter than factory length. (See Figure 3-40: “Top Mount Low Level Sensor Assembly” on page 97.)

To resize -

(See Figure 3-40: “Top Mount Low Level Sensor Assembly” on page 97.)

1. Loosen and remove the strain relief gland nut and strain relief from the top of the sensor assembly.
2. Loosen and remove the 1/4” (6mm) FNPT x 1/2” (13mm) tube compression fitting from the bottom of the assembly.
3. Slide the sensor assembly out from the bottom being careful not to damage the wiring as it is pulled from the assembly. DO NOT separate the 1/2” tube from the 5/8” tube.
4. Loosen the compression nut from the 1/2” (13mm) FNPT x 5/8” (16mm) tube compression fitting at the top of the assembly.
5. Using a tubing cutter, remove an “equal” amount from the end of each tube (5/8” and 1/2”). You must cut off the ferrule from both ends. Deburr the cuts using a fine emery paper.
6. Install a new 1/2” (13mm) compression ferrule on the end of the 1/2” O.D. tube. Carefully thread the sensor wire through the tube assembly.
7. Attach the 1/4” (6mm) FNPT x 1/2” (13mm) tube compression fitting, with sensor attached, to the end of the tube.
8. Install and tighten the 1/2” compression nut.
9. Install a new 5/8” (16mm) compression ferrule on the end of the 5/8” O.D. tube. Carefully thread the sensor wire through the flange and gasket assembly and install strain relief and strain relief gland nut. DO NOT tighten.

10. Install and tighten the 5/8” (16mm) tube compression nut.

11. Slide the 1/2” diameter tube in the 5/8” (16mm) diameter tube and adjust the telescoping section until the desired length is achieved, as measured from the bottom of the flange to the bottom of the sensor. Tighten the compression fittings on the union to lock length setting.

12. Tighten the strain relief gland nut and strain relief.

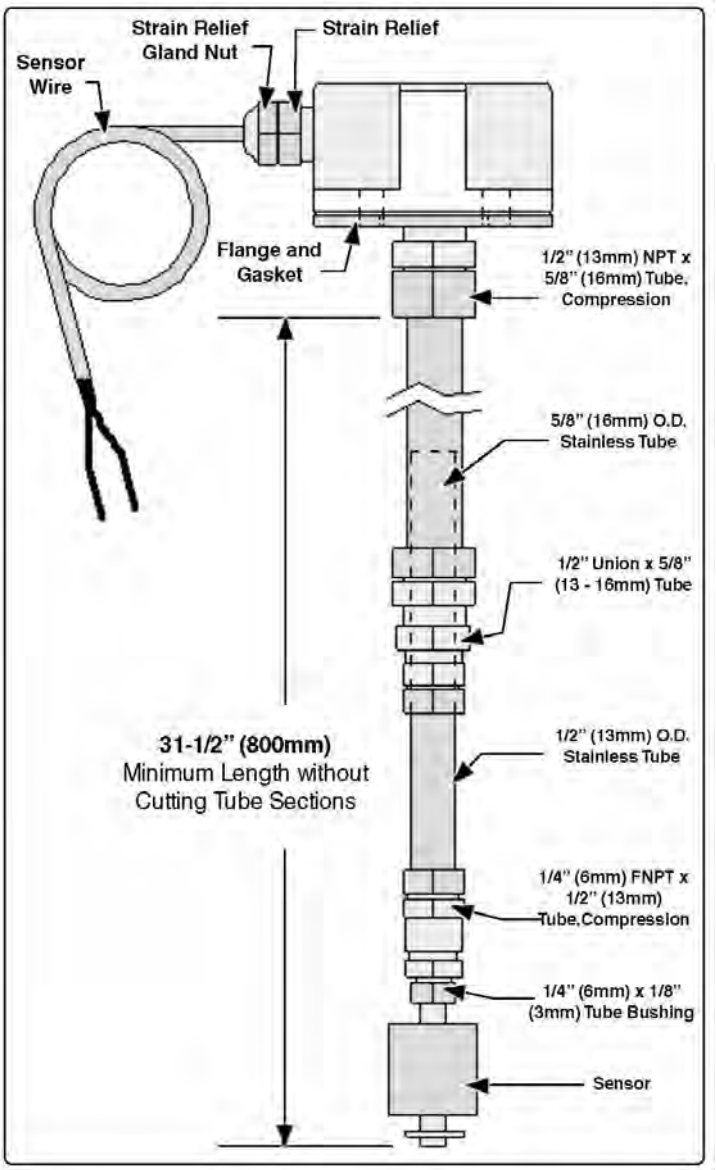


Figure 3-40: Top Mount Low Level Sensor Assembly

Low Level Sensor Wiring

CAUTION !

WHEN EXTENDING THE LOW TANK SENSOR WIRES MAKE SURE THE SPLICES ARE PROPERLY SEALED USING AN ADHESIVE FILLED HEAT SHRINK TUBING.

Single Foam Tank System

For cable harness overviews, see Section 9 " 9 Plate Drawings," on page 170. Also see Figure 3-32: "Single Tank Electrical Harness Overview" on page 87.

Use a minimum 16 AWG type SXL or GXL (SAE J1128) wire to extend the low tank sensor wire to the 2-pin Packard WeatherPack connector C10 of the main cable harness. Low tank level sensors are not polarity sensitive therefore terminal connections are not specific.

When splicing wires make sure the splices are sealed using an adhesive filled heat shrink tubing. Where two wires exit the heat shrink tubing pinch the tubing while heating the it to make sure the adhesive seals around both wires.

CAUTION !



USE THE SILICONE SEALER PROVIDED TO INSULATE AND PREVENT CORROSION.

A connector kit (Hale p/n: 546-1780-00-0) is available that contains a Packard WeatherPack 2-contact shroud half, two (2) 14-16 gauge male terminals and two (2) 14-16 gauge cable seals. Assemble these components to the end of the low tank sensor wires.

Snap the two halves of the WeatherPack connector together making sure they are sealed.

Note: If a Hale MST is not used, install the tank select jumper plug, Hale p/n: 513-0320-23-0, to connector C8. (See Figure 3-32: "Single Tank Electrical Harness Overview" on page 87.)

Dual Foam Tank System

For cable harness overviews, see Section 9 " 9 Plate Drawings," on page 170. Also see Figure 3-33: "Dual Tank Electrical Harness Overview" on page 88.

CAUTION !



BEFORE RUNNING WIRES FROM THE LOW TANK SWITCHES TO THE MAIN CABLE HARNESS MAKE SURE THE WIRES FROM TANK "A" ARE IDENTIFIED AND PROPERLY LABELED.

Use a minimum 16 AWG type SXL or GXL (SAE J1128) wire to extend the low tank sensor wires to the 2-pin Packard WeatherPack the following connectors of the main cable harness:

- ❑ Tank “A” - C10
- ❑ Tank “B” - C11

Low tank level sensors are not polarity sensitive therefore terminal connections are not specific.

When splicing wires make sure the splices are sealed using an adhesive filled heat shrink tubing. Where two wires exit the heat shrink tubing pinch the tubing while heating the it to make sure the adhesive seals around both wires.



CAUTION !

USE THE SILICONE SEALER PROVIDED TO INSULATE AND PREVENT CORROSION.

A connector kit (Hale p/n: 546-1780-00-0) is available that contains a Packard WeatherPack 2-contact shroud half, two (2) 14-16 gauge male terminals and two (2) 14-16 gauge cable seals. Assemble these components to the end of the low tank sensor wires.

Snap the two halves of the WeatherPack connector together making sure they are sealed.

Remote Activation Switch Option

(See Figure 3-41: “Remote Activation Switch Installation Dimensions” on page 100.)

Choose a location in the apparatus personnel compartment for mounting the remote activation switch. Make sure the switch is accessible to the operator without interfering with other controls on the apparatus.

Install the remote activation switch as follows:

Cutout the panel and drill the four 0.203 inch (5mm) diameter through holes. (See Figure 3-41: “Remote Activation Switch Installation Dimensions.”)

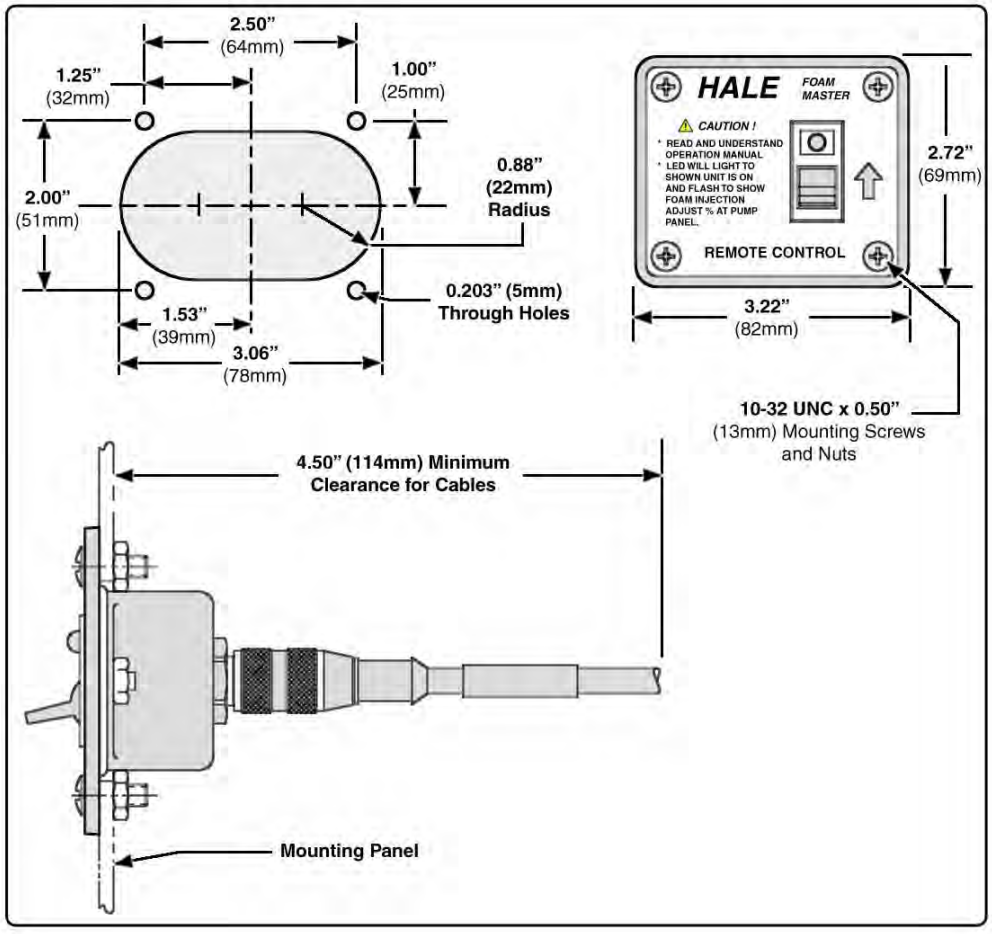


Figure 3-41: Remote Activation Switch Installation Dimensions

1. Insert switch assembly through the panel cutout and secure to using the #10-24 UNC x 1/2" (13mm) screws and nuts provided.

   Note: When making cable connections, make sure the cable is routed by the shortest most direct route. A maximum of 40 feet (12 meters) of remote cable may be used.

2. Connect the remote activation switch cable from the main cable harness connector C2. (See Figure 3-32: "Single Tank Electrical Harness Overview" on page 87.) Also see Figure 3-33: "Dual Tank Electrical Harness Overview" on page 88.

3.7 START UP CHECK LIST

Before energizing the apparatus and the Hale FoamLogix system for the first time make sure the following items are checked:

Electrical

Refer to the following for an overview of electrical connections:

- Figure 3-33: “Dual Tank Electrical Harness Overview” on page 88
- Figure 3-34: “Control/Display Unit Mounting Dimensions” on page 89
- For cable harness overviews, see Section “ 9 Plate Drawings,” beginning on page 170.
- Figure 3-35: “Distribution Box Connections” on page 90

- ❑ Tank LOW level sensor wires extended, if necessary, and connected to main cable harness (C10, C11).
- ❑ Tank LOW level sensor wires sealed against moisture with silicone sealant provided.
- ❑ Tank LOW level sensor(s) function properly.
- ❑ For single tank operation, if the Hale MST is not used, check that the tank select jumper plug is installed at connector C8.
- ❑ Control cable connection at distribution box is correct and tight.
- ❑ Flow sensor cable properly connected to main cable harness (C3).
- ❑ All cables and wires are secured and protected from damage during operation.
- ❑ Control and flow sensor cables properly folded and secured; radio antennas, power lines and equipment away from cables.
- ❑ Foam pump and motor assembly properly grounded using flat ground strap.
- ❑ Correct voltage provided. Direct current, negative (–) ground.
- ❑ Adequate current, 60 AMPS minimum, available. Main power direct to battery, battery switch or solenoid without primer or other accessories tied in.
- ❑ Primary electrical and ground connections tight and protected from corrosion with silicone sealant.
- ❑ Splices in wires sealed from moisture using adhesive filled heat shrink tubing.

- ❑ If ADT, MST or MDT II are used, check electrical cable connects.
- ❑ If the Remote Activation Switch is used, check electrical cable connections from the On/OFF switch.

Liquid

Refer to the following heading for overview drawings of typical plumbing arrangements:

- See Section 3.5 “System Plumbing Diagrams” on page 77.
- See Section “Plumbing Installation” on page 59.

- ❑ Flow sensor mounted with flow arrow in the correct direction for water flow.
- ❑ Check valves are properly mounted in water and foam concentrate lines.
- ❑ Strainer mounted for proper concentrate flow direction in foam tank to pump hose.
- ❑ Foam tank to foam pump valve is in place and open.
- ❑ Check valve/injector fitting lines are the proper size and connections are tight.
- ❑ Bypass valve is properly mounted and oriented for direction of concentrate flow.
- ❑ Foam concentrate gravity feeds to foam pump from foam concentrate tank.
- ❑ All hoses free of kinks and sharp bends.
- ❑ No sharp bends that can trap air exist in system.
- ❑ Flush water connections correct and tight.

  MST properly positioned with respect to the Foam Tank, or MDT II to Tank “A”
- ❑ Discharge piping hydro tested in accordance with NFPA/UL requirements.
- ❑ Bypass valve handle is in the INJECT position.

Foam Pump

Refer to the following heading for overview drawings of typical plumbing arrangements:

- See Section 3.5 “System Plumbing Diagrams” on page 77.
- See Section 3.1 “Foam Pump and Motor Assembly” on page 48.

❑ Foam pump and motor assembly mounted in horizontal position with base plate down.

❑ Foam pump and motor assembly properly secured using proper mounting hardware.

❑ Foam pump suction and discharge hoses connected to proper ports.

❑ Foam pump suction and discharge hose fittings tight.

Optional ADT

- See Section “ADT Option Air Connections” on page 73.

❑ Panel placard mounted on the operator panel.

❑ Air hose connected and all connections are tight.

❑ Selector switch is in the TANK “A” position

❑ Bypass valve handle is in the INJECT position.

3.8 INSTALLATION AND DELIVERY CHECK LIST

After the Hale FoamLogix system is installed, use the following check list to verify installation and ensure proper system setup when the apparatus is delivered to the end user.

Installation

Date	Initials		
_____	_____	❑	System properly installed. See Section 3.7 “Start Up Check List” on page 101.
_____	_____	❑	Tank level sensor function verified. See Section 3.7 “Start Up Check List” on page 101.
_____	_____	❑	Foam pump operation checked. See Section 3.7 “Start Up Check List” on page 101.
_____	_____	❑	Foam tank and hoses drained of water. See Section 3.7 “Start Up Check List” on page 101.
_____	_____	❑	Flow sensor function checked and calibrated. See Section 4.2 “User Calibration” on page 111.

Delivery

Date_____	Initials		
_____	_____	❑	Foam tank filled with user specified foam concentrate. See Section “Low Foam Tank Level Message” on page 126. Also see heading “Appendix A: Foam Concentrate Compatibility” on page 149.
_____	_____	❑	Foam pump priming checked. See Section 5.7 “Priming the Foam Pump” on page 128.
_____	_____	❑	Flow sensor calibration verified with Pitot. See Section 4.2 “User Calibration” on page 111.
_____	_____	❑	Default simulated flow value set to end user specification. See Section 4.2 “User Calibration” on page 111.
_____	_____	❑	Default foam concentrate injection rate set to end user specification. See Section 4.2 “User Calibration” on page 111.
_____	_____	❑	Foam concentrate feedback value verified and calibrated with end user specified foam concentrate. See Section 4.2 “User Calibration” on page 111.
_____	_____	❑	Proper Hale FoamLogix system operation demonstrated to end user in accordance with manual procedures. See Section 5 “Operation” on page 121.
_____	_____	❑	End user trained in proper operation of Hale FoamLogix system in accordance with manual procedures. See Section 4.2 “User Calibration” on page 111.
_____	_____	❑	Warranty registration card filled out by end user and mailed to Hale Products Inc.
_____	_____	❑	Two copies of Installation and Operation manual provided to end user.

3.9 SYSTEM INSTALLER START-UP

When energizing the Hale FoamLogix system at the system installer facility for the first time the following procedures shall be used.

Initial System Power Check

Observe the display on the control unit while energizing the apparatus electrical system. On initial power up of the apparatus, the Hale FoamLogix system begins a brief self-diagnostic routine. When completed, the system enters the STANDBY or System Ready mode. (See Figure 3-43: “Initial Start-Up, System Ready Displays.”)

Check the control unit readout — **FLOW, TOTAL FLOW, % FOAM, TOTAL FOAM** and that all bar graph LEDs illuminate along with **88888** for several seconds.

HALE CLASS 1 2002 scrolls across the display during the self-diagnostics, followed by the default display. The default display is zero on the digital readout (if no water is flowing) and FLOW LED. (See Figure 3-43: “Initial Start-Up, System Ready Displays.”)

If the system ready display does not appear, see Section “7 Troubleshooting” on page 141 for more information.

Note: Pressing the DISPLAY button (**i**) cycles through the four functions as indicated by the red LED illuminating under each function (FLOW, %, TOTAL FLOW and TOTAL FOAM).

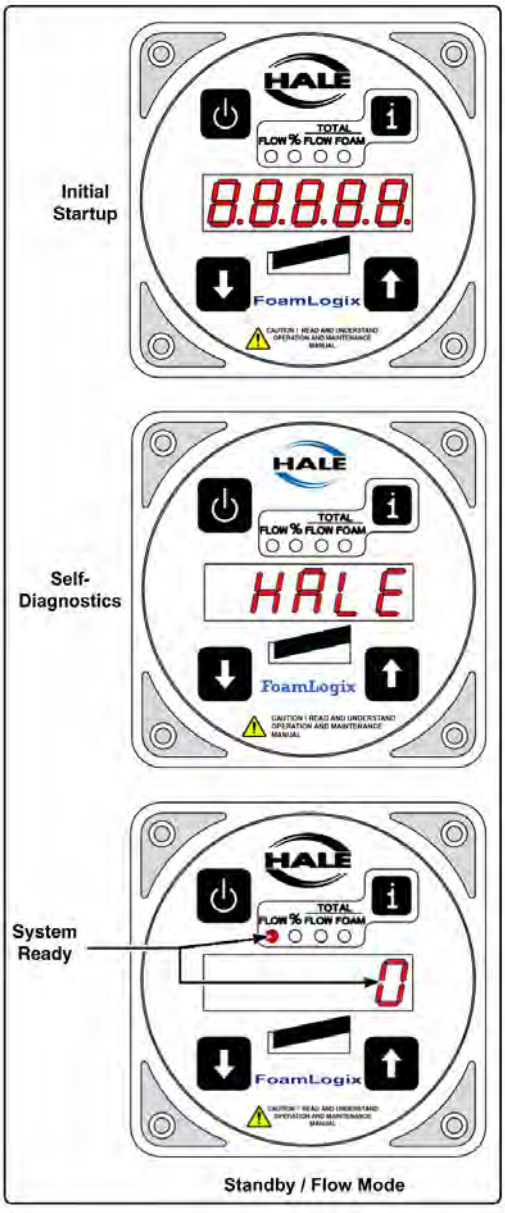


Figure 3-43: Initial Start-Up, System Ready Displays

System Operation Check

After initial system power-up, low tank level sensor operation, foam pump operation and flow sensor calibration must be checked.

CAUTION !



WATER IS USED AT THE SYSTEM INSTALLER FACILITY TO VERIFY LOW TANK LEVEL SENSOR OPERATION AND FOAM PUMP OPERATION AS THE END USER SPECIFIED FOAM CONCENTRATES MAY NOT BE READILY AVAILABLE.

DO NOT PUMP WATER WITH THE HALE FOAMLOGIX FOAM PUMP FOR MORE THAN ONE MINUTE PER FOAM TANK.

DO NOT ATTEMPT TO CALIBRATE FOAM PUMP FEEDBACK SENSOR WITH OTHER THAN END USER SPECIFIED FOAM CONCENTRATE.

MAKE SURE THE BYPASS VALVE IS IN THE BYPASS POSITION WHEN PUMPING WATER WITH THE FOAM PUMP.

1. On initial power-up with the foam tanks empty, the display on the control unit alternates between **O** and **Lo A** indicating the foam tank is empty.

   Fill foam concentrate tank A with water. The **Lo A** indication should disappear from the display, indicating the low tank level sensor in Tank A is operating properly.

2. If the system is equipped with an ADT or MDT II, move the selector to the TANK B position and observe the display. The display should alternate between **O** and **Lo B** indicating this foam tank is empty.

   Fill foam concentrate tank B with water. The **Lo B** indication should disappear from the display, indicating the low tank level sensor in Tank B is operating properly.

3. If the system is equipped with an ADT, MDT II or MST, place the selector in the **FLUSH** position. **FLUSH** and **O** should alternate on the display.

4. With proper operation verified, place the selector to **TANK A** position (or **FOAM TANK** position on MST).

Note: The bypass valve pull handle on the ADT has two detents that the valve must pass through to be fully open. Make sure the bypass valve is fully opened before attempting to operate foam pump.

5. Place the BYPASS valve in the **BYPASS** position to check foam pump operation. Place a calibrated five gallon container at the discharge of the bypass hose.

6. Place the system in simulated flow mode by selecting the **FLOW** display and pressing both ↑ and ↓ buttons simultaneously. Set simulated flow value to 100 GPM by pressing the ↑ or ↓ buttons. (See Figure 3-44: "Simulated Flow Mode Display.")

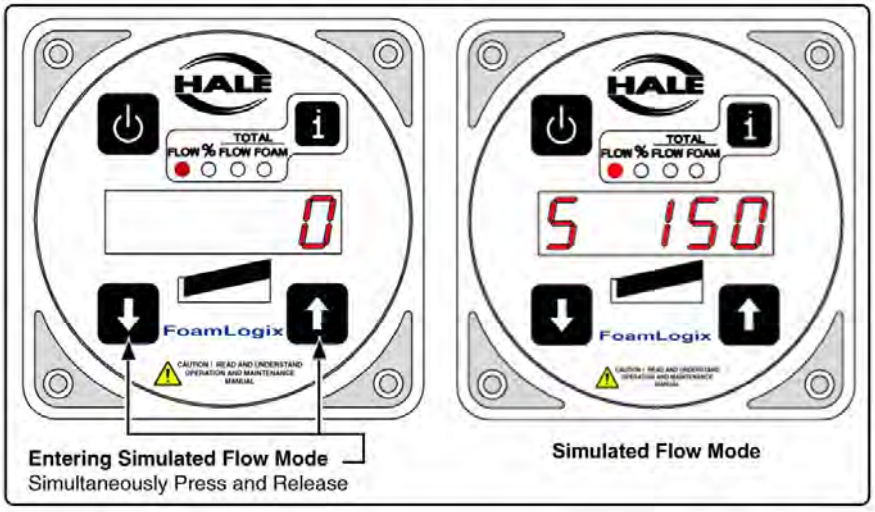


Figure 3-44: Simulated Flow Mode Display

7. The display show **S** at the left most position to indicate the simulated flow mode is selected.

8. Press the **SELECT DISPLAY** button until the LED under **% FOAM** illuminates. Set foam concentrate injection rate to **1.0** by pressing the ↑ or ↓ buttons.

9. Press the **SELECT DISPLAY** button until the LED under **TOTAL FOAM** illuminates.

10. Engage the Hale FoamLogix system by pressing the **ON** button. Observe the discharge of the bypass hose to make sure the foam pump is operating.

11. After one minute press the **i** button to stop the foam pump. There should be approximately one gallon of water in the container and **TOTAL FOAM** reading on the display should show approximately **1.0**.

Note: If the system is equipped with an ADT or MDT II, move the selector to **TANK B** position and repeat steps 8 through 10 for Tank B.

12. After foam pump operation has been checked with both foam tanks exit simulated flow mode by selecting the **FLOW** display and depressing both up ↑ and down ↓ buttons simultaneously.

13. Drain water from foam tanks and concentrate lines and return the bypass valve to the **INJECT** position.

14. Verify operation of and calibrate flow sensor(s) as required using flow sensor calibration procedures in the user calibration section.

This completes the Hale FoamLogix system operation checks that can be accomplished at the system installer facility. Foam pump feedback calibration along with setting of user specified default simulated flow and concentrate injection rates should be accomplished upon delivery to the end user using actual end user specified foam concentrates and default values.

4 User Setup and Calibration

4.1 INITIAL END USER SETUP

When the apparatus is delivered to the end user facility the foam tank(s) must be filled with the specified foam concentrate(s). Make sure the proper foam concentrate is put into the correct tank. The system must then be adjusted to operate with the end user foam concentrate(s) for best accuracy. Also see heading “Appendix A: Foam Concentrate Compatibility” on page 149.

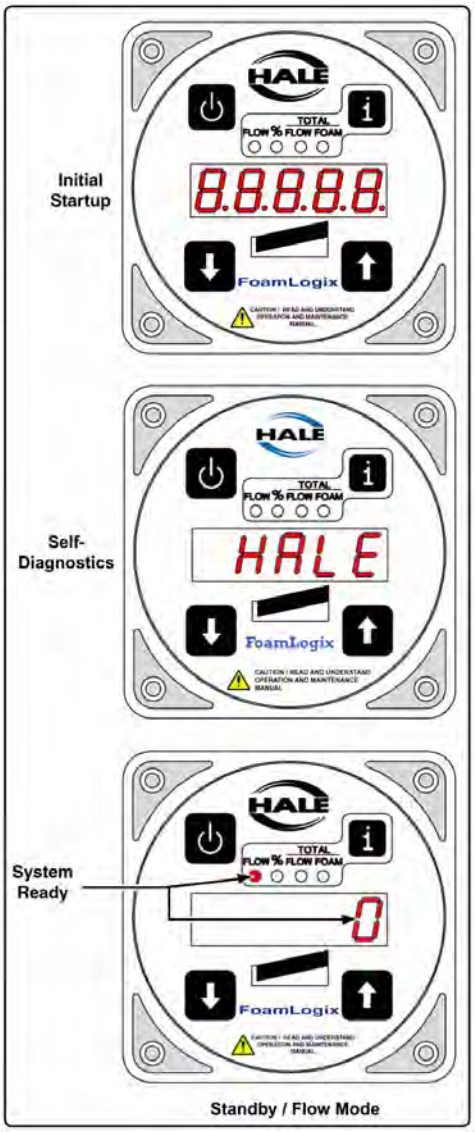


Figure 4-1: Initial Start-Up, System Ready Displays

System Power Check

Observe the display on the control unit while energizing the apparatus electrical system. On initial power up of the apparatus, the Hale FoamLogix system begins a brief self-diagnostic routine. When completed, the system enters the STANDBY or System Ready mode. (See Figure 4-1: “Initial Start-Up, System Ready Displays.”)

Check the control unit readout — **FLOW, TOTAL FLOW, % FOAM, TOTAL FOAM** and that all bar graph LEDs illuminate along with **88888** for several seconds.

HALE CLASS 1 2002, followed by the software revision level (e.g., **r x.x**) scrolls across the display during the self-diagnostics, followed by the default display. The default display is zero on the digital readout (if no water is flowing) and FLOW LED. (See Figure 4-1: “Initial Start-Up, System Ready Displays.”)

If the system ready display does not appear, see Section “7 Troubleshooting” on page 141 for more information.

Note: Pressing the DISPLAY button (i) cycles through the four functions as indicated by the red LED illuminating under each function (FLOW, %, TOTAL FLOW and TOTAL FOAM).

Priming the Foam Pump

After the foam tank(s) are filled with the proper foam concentrate and the system is powered up, foam concentrate flow must be checked to verify the foam pump is primed.

CAUTION !

WHEN OPERATING THE HALE FOAMLOGIX IN SIMULATED FLOW MODE AN OUTLET FOR THE FOAM CONCENTRATE MUST BE PROVIDED TO PREVENT EXCESSIVE PRESSURE BUILDUP IN DISCHARGE PIPING OR HOSES.

1. Make sure the bypass valve is in the **BYPASS** position. Route the bypass hose into a suitable container to collect the discharged foam concentrate.

   Note: If dual foam tank system is used select TANK A. Make sure there is foam concentrate in both foam tanks.

2. Place the system in simulated flow mode by selecting the **FLOW** display and pressing both ↑ and ↓ buttons simultaneously. (See Figure 4-2: "Simulated Flow Mode Display.")

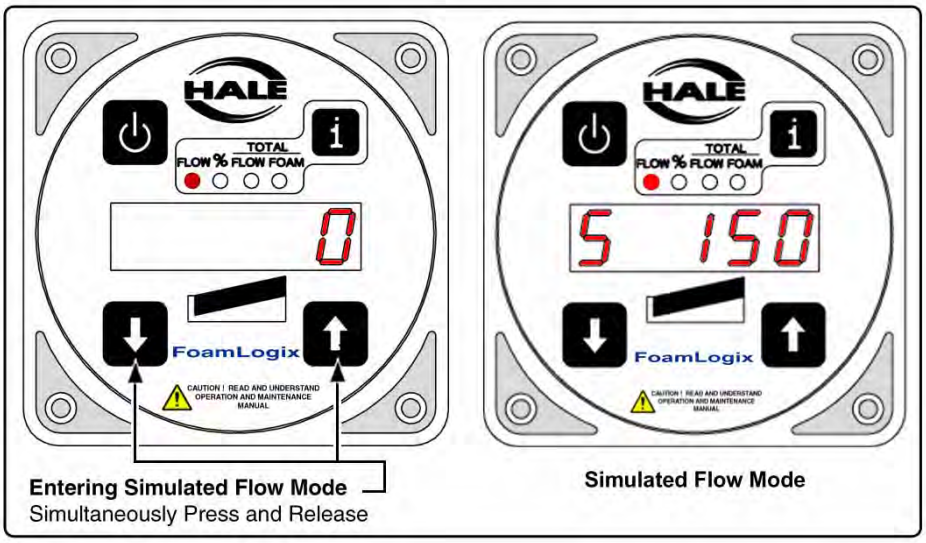


Figure 4-2: Simulated Flow Mode Display

Increase the simulated flow value by pressing ↑ button to allow easier priming (above factory default value of 150 GPM). The display shows **S** at the left most position to indicate the simulated flow.

3. Engage the Hale FoamLogix system by pressing the **ON** button. The left LED on the horizontal bar graph illuminates to indicate the system is on.

4. As the foam pump begins to run the bar graph LEDs to the right illuminate, indicating foam concentrate is being pumped.

   If no concentrate is flowing the pump increases to maximum speed in an attempt to prime itself. All LEDs illuminate and FLASH. The pump runs at full speed until a feedback signal is indicated or for a maximum of thirty (30) seconds. If no feedback signal is present after 30 seconds the system shuts down and the display show **noPri** (no prime).

   Repeat this step one more time to attempt to prime the pump.

5. If the foam pump does not prime after the second try:

   - ❑ Make sure all foam concentrate valves are open.
   - ❑ Make sure there are no restrictions in the hose from the foam concentrate tank to the inlet of the foam pump.
   - ❑ Make sure there are no air traps in the hose from the foam concentrate tank to the inlet of the foam pump.
   - ❑ Make sure there are no leaks in the plumbing where air can enter.

6. If the system is installed properly, foam concentrate should flow readily to the pump. Observe the clear foam suction line to verify foam is flowing.

7. If a dual tank system is installed, switch to **TANK B** and repeat priming procedure for this tank.

8. Once foam flow is established from both tanks, turn the system OFF and set the bypass valve to the **INJECT** position.

Proceed with user calibration.

4.2 USER CALIBRATION

The complete Hale FoamLogix 3.3, 5.0 or 6.5 System; the foam pump and motor assembly, control unit and flow sensor, are tested at the factory before shipping to the installer. If the Hale FoamLogix system is properly installed, further calibration is not necessary until delivery to customer.

The system allows easy checking of component calibration to assure accurate operation. The calibration process verifies the calibration process and allows adjustments to the flow sensor and feedback sensor display readings, to allow for variations in apparatus piping configurations and end user selected foam concentrate.

Default values for simulated flow and the foam concentrate injection rate may be set to end user specifications while in the calibration mode.

Note: The Hale FoamLogix system is calibrated at the factory to U.S. measurement (GPM, PSI, GALLONS, etc.) units. The system may be set to Metric units. See heading “English to Metric Units” on page 120. However, the same unit of measurement must be used throughout the calibration process to ensure proper proportioning by the system.

Recalibration of the system may be required ONLY after major repairs or component changes are made to the Hale FoamLogix foam system. Different viscosity foam concentrates may also require recalibration.

CAUTION !



WATER IS USED AT THE SYSTEM INSTALLER FACILITY TO VERIFY LOW TANK LEVEL SENSOR OPERATION AND FOAM PUMP OPERATION, AS THE END USER SPECIFIED FOAM CONCENTRATES MAY NOT BE READILY AVAILABLE.

DO NOT PUMP WATER WITH THE HALE FOAMLOGIX FOAM PUMP FOR MORE THAN ONE (1) MINUTE. DO NOT ATTEMPT TO CALIBRATE FOAM PUMP FEEDBACK SENSOR WITH OTHER THAN END USER SPECIFIED FOAM CONCENTRATE.

MAKE SURE THE BYPASS VALVE IS IN THE “BYPASS” POSITION WHEN PUMPING WATER WITH THE FOAM PUMP.

Entering Passwords

Entering a password is accomplished using the up and down arrow buttons on the display unit.

1. To enter passwords, press and hold the **DISPLAY** button. The display briefly shows **PASS,** then clears.

Mode	Password Sequence
ENTER User Calibration	↑ ↑ ↑ ↑
RESTORE Factory Default Values	↑ ↑ ↓ ↑

Figure 4-3: Password Sequence

2. While continuing to hold the display button press the ↑ or ↓ buttons sequentially to enter the password. (See Figure 4-3: “Password Sequence.”)

Restoring Factory Defaults

To return to the factory default values, enter the restore factory values password (↑ ↑ ↓ ↑). (See Figure 4-3: “Password Sequence.”)

Once the password is entered correctly the control unit displays **FAC** and returns to normal operation.

Factory default values:

- ❑ Simulated Flow -150 GPM (568 LPM)
- ❑ % FOAM - 0.5% Class “A”

(See Figure 4-4: “Password and Calibration Modes - Display.”)

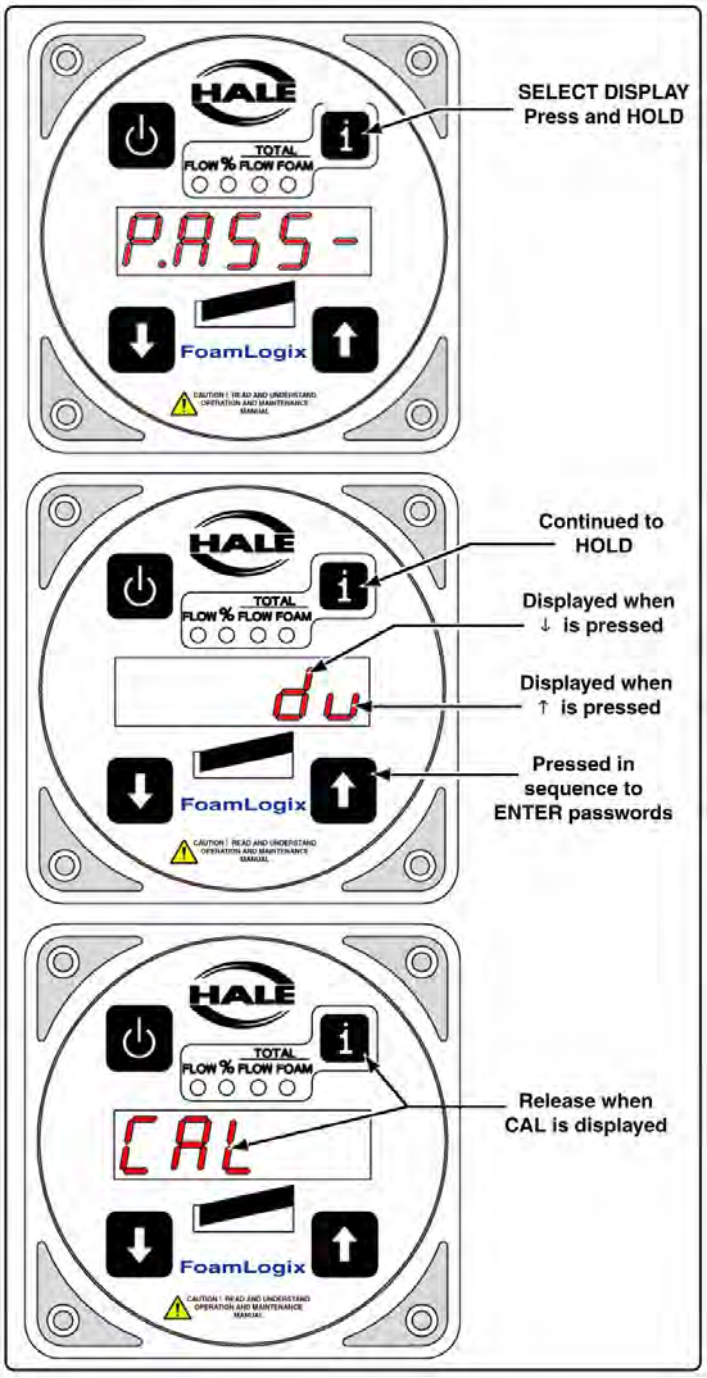


Figure 4-4: Password and Calibration Modes - Display

Calibration

1. To enter a calibration password, press and hold the SELECT DISPLAY button (**i**). The display shows PASS, then clears.
2. While holding **i** pressed, enter the calibration password (↑ ↑ ↑ ↑).

3. The display shows **CAL** for several seconds, followed by **CO** (or **LO** when display is set to metric). (See Figure 4-4: “Password and Calibration Modes - Display” on page 113.)

4. The **FLOW** LED (Water Flow Sensor Calibration) also illuminates.

Flow Sensor Calibration

Verify flow sensor calibration during NFPA/UL testing of the apparatus and delivery to end user. (See Figure 4-5: “Flow Sensor Calibration - Display.”)

IMPORTANT !

AN ACCURATE FLOW MEASURING DEVICE MUST BE USED TO MEASURE THE WATER FLOW WHEN CALIBRATING THE FLOW SENSOR. USE A SUITABLE SIZE, SMOOTH BORE, NOZZLE AND AN ACCURATE AND CALIBRATED PITOT GAUGE INSTRUMENT. HAND HELD PITOT GAUGES ARE USUALLY NOT VERY ACCURATE.

MAKE SURE THE SYSTEM IS CALIBRATED WITH AN ACCURATE FLOW MEASURING DEVICE.

1. Determine the water flow normally expected from the discharge outlet and establish flow.

2. Make sure the water flow established is within the range of the flow sensor monitoring the discharge.

   For example, establish a flow rate of 150 GPM (568 LPM) of water through a nozzle and Pitot system. Compare the calculated flow value to the value shown on the control unit display.

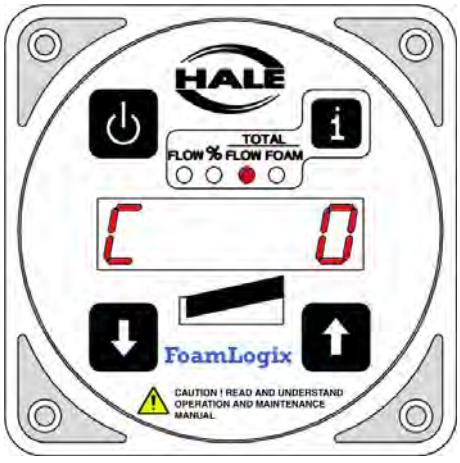


Figure 4-5: Flow Sensor Calibration - Display

3. Press the ↑ or ↓ button and set the reading to match the actual flow calculated from the Pitot gauge reading.

4. Decrease fire pump pressure by approximately one half (1/2) and recalculate water flow rate.

Verify that the reading on the control unit is within 5% of the actual value.

5. STOP the water flow when adjustments are completed.

Record Calibration Factors

1. Press and release the **i** button. The display shows **F xx.x**, which is the water flow sensor calibration factor. (See Figure 4-6: "Flow Sensor Calibration Factor.")

2. Record this value for future reference. This factor can be programmed into the existing display if the display is ever replaced or to provide a baseline calibration point.

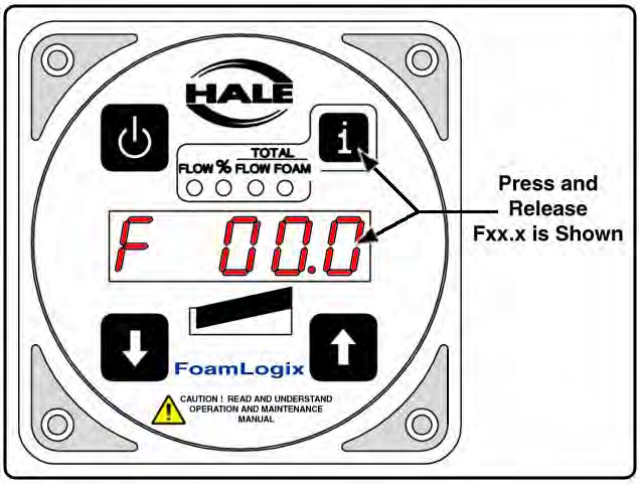


Figure 4-6: Flow Sensor Calibration Factor

WATER FLOW SENSOR CALIBRATION FACTOR: _____

Simulated Flow

The default Simulated Flow value is factory set to 150 GPM (568 LPM) and, if necessary, may be adjusted while in the user calibration mode.

1. Press the **i** button. The default simulated flow rate is shown. (See Figure 4-7: "Simulated Flow Calibration.")

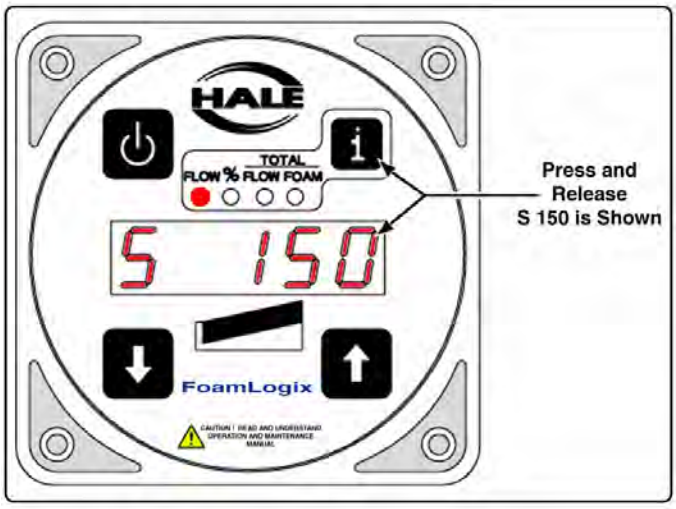


Figure 4-7: Simulated Flow Calibration

2. Adjust the setting to the required rate by pressing the ↑ or ↓ buttons (e.g., **S 150**).

Foam Concentrate Injection Rate

When the Hale FoamLogix system is powered ON, the foam concentrate injection rate stored in memory is the default setting. The user specific default concentrate injection rate is adjusted in the calibration mode.

1. Press the **i** button.

   The display shows the current default concentrate injection rate stored in memory for the selected foam concentrate tank. (See Figure 4-8: "Foam Concentrate Injection Rate Default Value, Tank "A" Shown.")

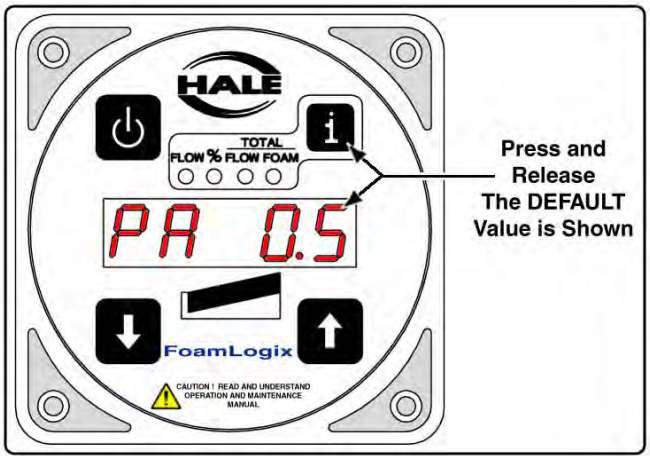


Figure 4-8: Foam Concentrate Injection Rate Default Value, Tank "A" Shown

2. If the factory default values have not been changed the display shows **PA 0.5**. for Tank "A" or **PB 1.0** for Tank "B".

3. Use the ↑ or ↓ buttons to set the user specified default concentrate injection rate. (See Figure 4-8: "Foam Concentrate Injection Rate Default Value, Tank "A" Shown" on page 116.)

Foam Pump Feedback Calibration

IMPORTANT !

FOAM PUMP FEEDBACK IS CALIBRATED AFTER INSTALLATION TO VERIFY VALUES WITH THE ACTUAL FOAM CONCENTRATE(S) BEING USED. ONLY CALIBRATE USING ACTUAL FOAM CONCENTRATES.

DO NOT USE WATER, TRAINING OR TEST FOAMS FOR FEEDBACK CALIBRATION VERIFICATION.

1. Press the **i** button.

2. The display shows **A x.xx** for Tank "A", or **B x.xx** for Tank "B" for the total volume of foam concentrate pumped during the last calibration run. (See Figure 4-9: "Foam Pump Feedback Calibration, Tank "A" Shown.")

3. Set the bypass valve to the **BYPASS** position.

4. Place a graduated measure container at the outlet of the bypass hose, capable of containing the expected volume of foam concentrate, 5 gallons (19 liters) minimum. (See Figure 4-10: "Foam Concentrate Collection" on page 117.)

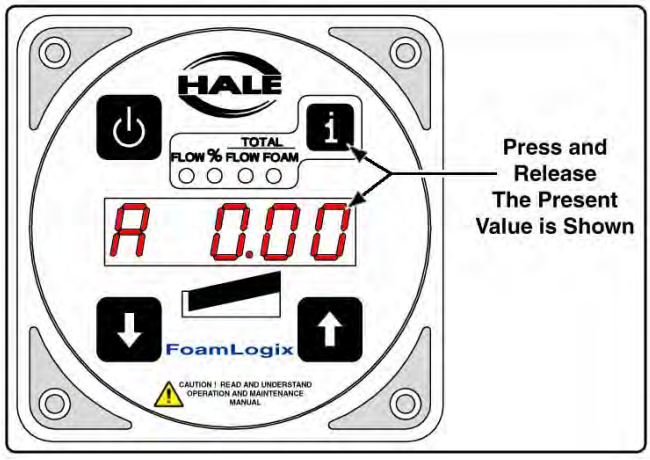


Figure 4-9: Foam Pump Feedback Calibration, Tank "A" Shown

Note: If an accurate calibrated container is not available, use an accurate scale to weigh the foam concentrate pumped. The total volume of foam concentrate can then be calculated from the weight and the density of the foam from the MSDS sheet.

5. Start the Hale FoamLogix foam pump by pressing the red **ON** button.

   The LEDs on the horizontal bar graph light as the foam pump begins operating at approximately two-thirds speed, pumping foam concentrate into the container. The display shows the volume of foam concentrate being pumped.

6. STOP the foam pump and accurately measure the amount of foam concentrate collected. (See Figure 4-10: "Foam Concentrate Collection.")

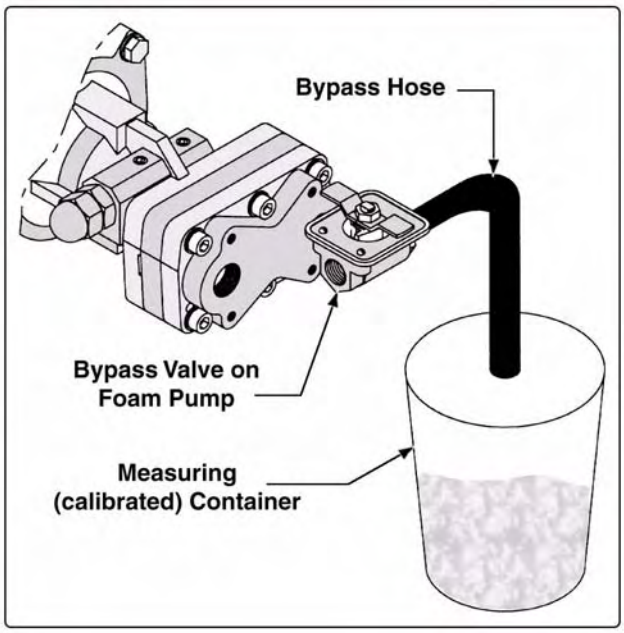


Figure 4-10: Foam Concentrate Collection

7. Adjust the reading on the display to match the volume actually pumped using the ↑ or ↓ button.

8. Repeat the procedure as necessary to verify the setting is correct.

9. Set the bypass valve handle back to the **INJECT** position.

Record Foam Feed Back Factor

1. Press and release the **i** button.

2. The display shows **FA xxx** for Tank "A", or **FB xxx** for Tank "B" for the foam pump feedback calibration factor. (See Figure 4-11: "Feedback Calibration Factor, Tank "A" Shown.")

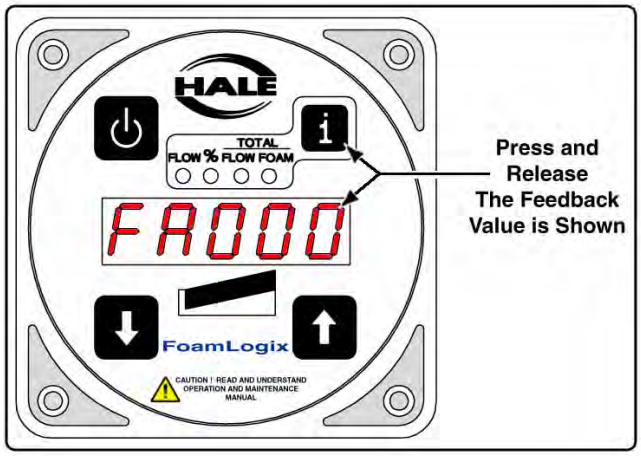


Figure 4-11: Feedback Calibration Factor, Tank "A" Shown

3. Record this value for future reference on the next page. This factor can be programmed into the display if the display is ever replaced or to provide a baseline calibration point.

CLASS "A" FOAM PUMP FEEDBACK
CALIBRATION FACTOR: _____

CLASS "B" FOAM PUMP FEEDBACK
CALIBRATION FACTOR: _____

Exit and Save Calibration

1. To exit the calibration mode and save the set values, press and hold the **i** button.

2. The display shows **PASS**, then clears.

3. While continuing to hold the display button enter the password (↑ ↑ ↑ ↑).

4. The display shows **SCAL** for several seconds then cycles through the start-up sequence followed by the flow display **O**. (See Figure 4-12: “Exit and Save Calibration.”)

5. This completes verification and adjustment of the system. The Hale FoamLogix system is now ready to be placed in service.

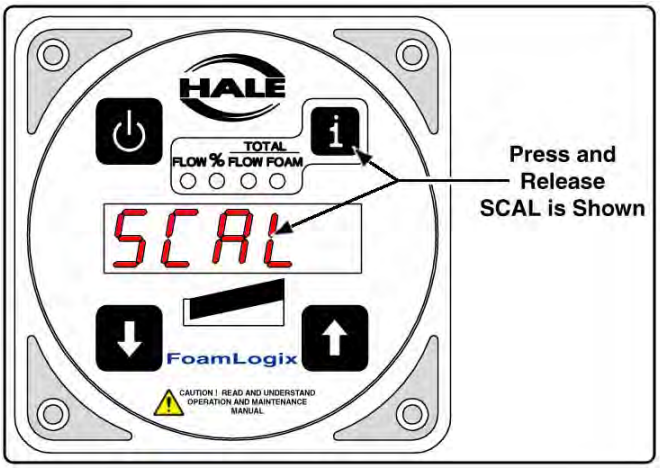


Figure 4-12: Exit and Save Calibration

Relief Valve

The pressure relief valve is factory tested and set to

- ❑ Model 3.3 - 350 PSI (24 BAR)
- ❑ Model 5.0 - 200 PSI (14 BAR)
- ❑ Model 6.5 - 200 PSI (14 BAR)

(See Figure 4-13: “Relief Valve.”)

During normal installation and operation, the relief valve does not require adjustment.

If adjustment is necessary during field installation, contact Hale Products Inc. at **610-825-6300** for Relief Valve Service information.

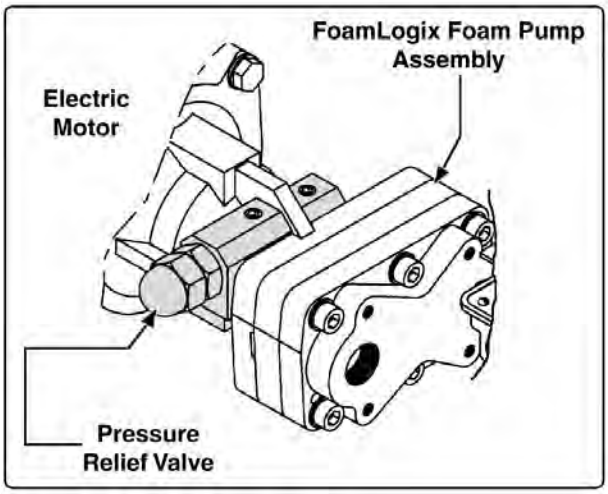


Figure 4-13: Relief Valve

English to Metric Units

The FoamLogix Display offers both English and Metric readouts.

The Hale FoamLogix system is calibrated at the factory for ENGLISH - U.S. measurement units (GPM, PSI, GALLONS, etc.).

To switch from English to Metric and back again,

1. Press and hold the **i** button. The display show **PASS**, then clears.
2. While continuing to hold the display button, enter the password (↓ ↑ ↑ ↓).
3. The display shows **IN** to indicate Metric units are selected.

Note: Switching back to English is accomplished by repeating Steps 1 through 3. The display shows **EN** to indicate English units.

5 Operation

5.1 DESCRIPTION

Operation of Hale FoamLogix system is controlled by the Digital Display Control Unit, provided with four push buttons (pads). (See Figure 5-1: “Control Unit Identification.”)

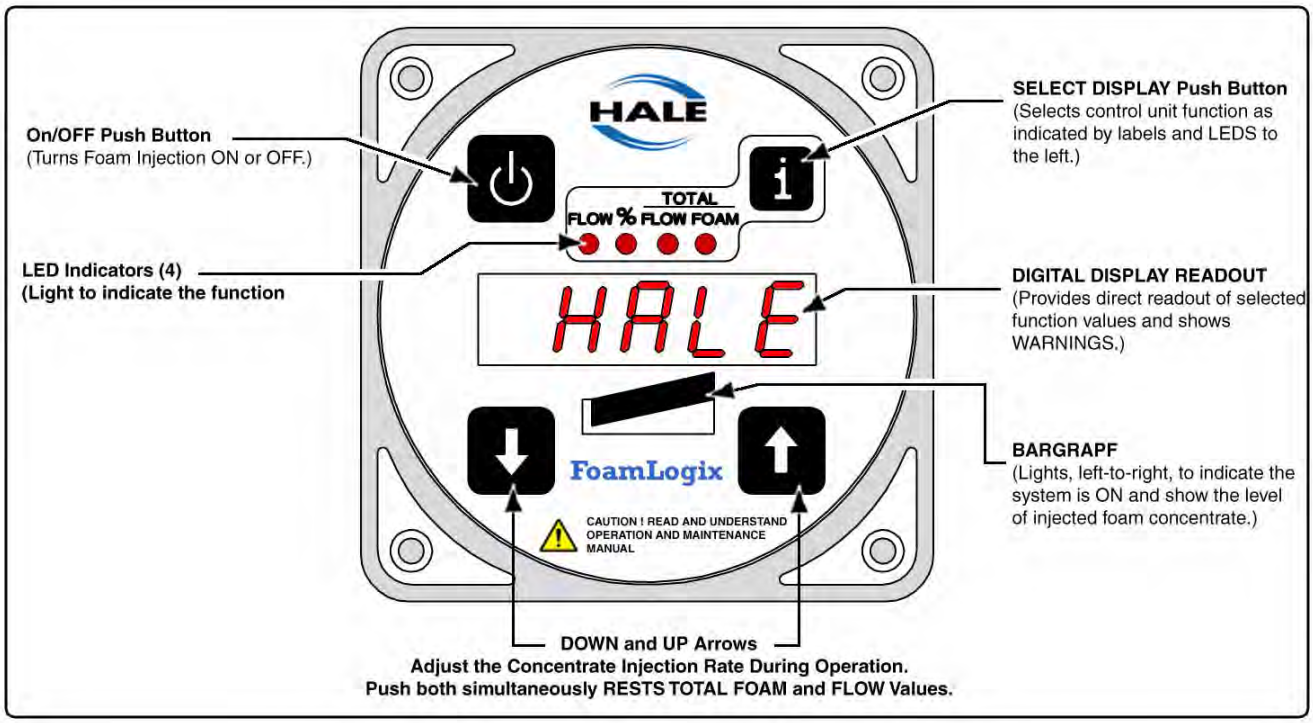


Figure 5-1: Control Unit Identification

The Hale FoamLogix system constantly monitors the water and foam concentrate flow values, maintaining foam injection at the specified concentrate injection rate. The system responds to variations in water flow by increasing or decreasing the speed of the foam pump.

On initial power up of the apparatus, the Hale FoamLogix system begins a brief self-diagnostic routine. When completed, the system enters the STANDBY mode. The **FLOW** LED illuminates and the display shows the current water flow rate in the monitored discharge pipe. (See Figure 5-2: “Function Modes,” on page 123.)

Pressing the DISPLAY button (**i**) cycles through the four functions as indicated by the red LED illuminating under each function (FLOW, %, TOTAL FLOW and TOTAL FOAM).

Note: TOTAL FLOW and TOTAL FOAM values may be reset any time while they are displayed. When the % FOAM LED is ON, or in any other function mode, the foam concentrate injection rate may be set to the desired value, if different from the default value. This may be adjusted prior to or during foam operations by pressing the ↑ or ↓ arrow buttons. Also see heading “Control Unit Functions” on page 122.

When the **ON** button is pressed, the FLOW LED illuminates indicating that the system is ready. If water flow is present the foam pump starts and begins injecting foam concentrate into the discharge stream. Also see Figure 5-1: “Control Unit Identification” on page 121.

The bar graph illuminates, left-to-right, when foam is being injected and indicates system capacity.

When the **ON** button is pressed again, the LEDs extinguish, indicating that the system is in STANDBY mode and the foam pump STOPS. However, other system monitoring functions continue.

5.2 CONTROL DISPLAY UNIT

The five-digit display on the control unit shows the value of the selected function and provides WARNINGS messages to the operator during system operation.

A function is selected by pressing the DISPLAY button (**i**). Each time the button is pressed a new function mode is selected and displayed. LEDs directly below the selected function illuminate to denote which function is selected. (See Figure 5-1: “Control Unit Identification,” on page 121.)

Note: Pressing the DISPLAY button (**i**) changes the control unit functions but does not affect injection rate.

Control Unit Functions

(See Figure 5-2: “Function Modes,” on page 123.)

Flow

Selecting FLOW shows the current flow rate of the water or foam solution, per minute, in Hale flow sensor monitored discharges. (See Figure 5-2: “Function Modes,” on page 123.)

% Foam

Selecting % FOAM shows the foam concentrate injection rate setting.

For example, with a single tank system or when the dual tank system selector is in the TANK "A" position the display shows **A 0.5**. When the dual tank system selector is in the TANK "B" position the display shows **B 1.0**. (See Figure 5-2: "Function Modes.")

When the system includes an MST, MDT II or ADT and the selector is in the FLUSH position the display reads **FLUSH**. (See Figure 5-3: "Flush," on page 125.)

Total Flow

Selecting TOTAL FLOW shows the total amount of water or foam solution pumped through flow sensor monitored discharges. This totalized value may be reset - see heading 5.3 "Reset Functions" on page 124.

Total Foam

Selecting TOTAL FOAM shows the total amount of foam concentrate pumped.

The value is in the same unit of measure as the water flow. This totalized value may be reset - see heading 5.3 "Reset Functions" on page 124.

For example, the display may show **9.5**, indicating 9.5 gallons (36 liters) of foam concentrate have been used. (See Figure 5-2: "Function Modes.")

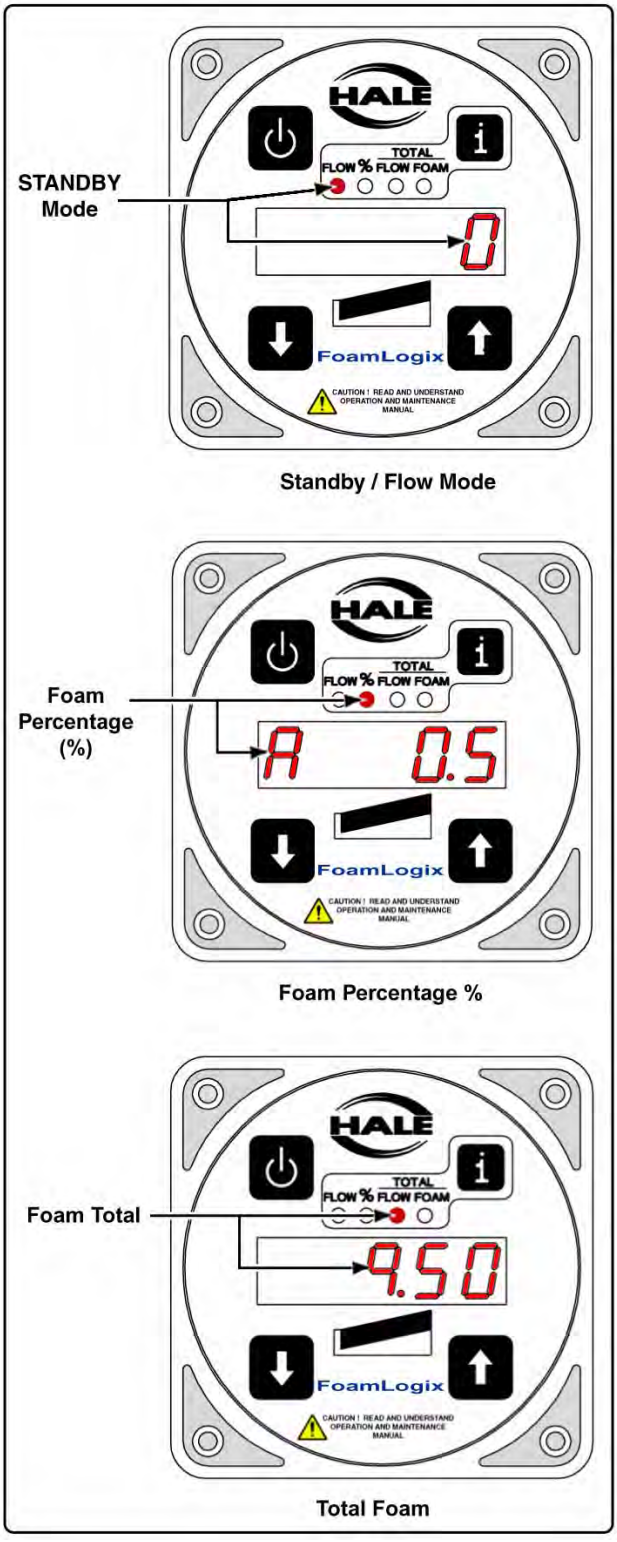


Figure 5-2: Function Modes

Bar Graph

(See Figure 5-1: “Control Unit Identification,” on page 121.)

The bar graph consists of a ten (10) LED array. When the ON button is pressed the left-most LED illuminates to indicate the system is ON and ready to inject foam concentrate.

When water is flowing, the LEDs to the right on the bar graph illuminate indicating foam concentrate is being injected. The number of LEDs illuminated indicates the approximate pump capacity being used (percentage of foam being pumped).

If the water flow requirements exceed the capacity of the pump, the pump speed increases to its maximum rate. All bar graph LEDs illuminate and the right-most LED FLASHES, warning the operator that the system capacity is being exceeded and the system is running “**lean**” on foam concentrate percentage.

If the flow decreases such that the required injection rate is less than the lowest rating of the pump, the pump speed decreases to its minimum rate. The first bar graph LED to the left FLASHES, warning the operator that the system capacity is being exceeded and is running “**rich**” on foam concentrate percentage.

5.3 RESET FUNCTIONS

The totalized values for water and foam concentrate being pumped are cleared from memory by performing the **RESET** function.

1. Using the DISPLAY button (**i**), select either **TOTAL WATER** or **TOTAL FOAM**.

2. By pressing and holding both the ↑ and ↓ buttons simultaneously, the value shown is cleared and the display shows zero (**0**).

3. Additionally the totalized values for the water and foam concentrate reset to zero (**0**) automatically when the apparatus power is turned OFF.

5.4 FOAM CONCENTRATE INJECTION RATE

When **% FOAM** is selected, the ↑ or ↓ buttons respectively increase or decrease foam concentrate percentage.

While operating in any function, with the exception of FLOW during simulated flow operation, whenever the ↑ or ↓ buttons are momentarily pressed, the display switches to the % FOAM display and shows the current injection rate for two (2) seconds.

In any display mode, if either the ↑ or ↓ button is held down for a period of two (2) seconds or more, the injection rate value increases or decreases accordingly. Once released, the display returns to the last selected display after two (2) seconds.

When a RESET is performed while in the % FOAM mode, the foam concentrate injection rate returns to the default value.

5.5 FLUSH

Also see heading “Flushing Hale FoamLogix” on page 135. Also see Figure 5-3: “Flush.”



Figure 5-3: Flush

If the Hale FoamLogix system is equipped with an ADT, MDT II or MST and the operating controls for these selectors are in the **FLUSH** position, the foam pump motor increases to approximately 80% capacity. The system operates for twenty (20) seconds when water is flowing, then switches to the STANDBY mode.

When in **FLOW** or **TOTAL FLOW** mode the display alternates between **FLUSH** and the value of the selected function. These modes function normally when in FLUSH mode.

When in % FOAM or TOTAL FOAM mode, **FLUSH** is shown steady on the display. These modes do not function while in FLUSH mode.

5.6 WARNING MESSAGES

Several safety features are incorporated into the Hale FoamLogix system to protect the foam concentrate pump, electric motor and apparatus wiring while maintaining personnel safety. These are described beginning on the next page.

Messages appearing on the display alert the operator to adverse conditions that could cause damage to Hale FoamLogix system components, the apparatus and cause personnel injury.

Low Foam Tank Level Message

The Hale FoamLogix foam pump is interlocked with the foam concentrate tank LOW level switch. If the tank is empty, the pump runs for one (1) minute. A low foam concentrate tank level message is shown (**Lo A** or **Lo B**) alternating with the normal selected function on the display. (See Figure 5-4: "Low Foam Tank Message, Tank "A" Shown.")

If one minute of low concentrate level is detected,

- ❑ **no A** for Tank "A" or
- ❑ **no B** for Tank "B"

is shown and the pump STOPS. The left-most LED extinguishes until the foam level is restored and the **ON** button is pressed.

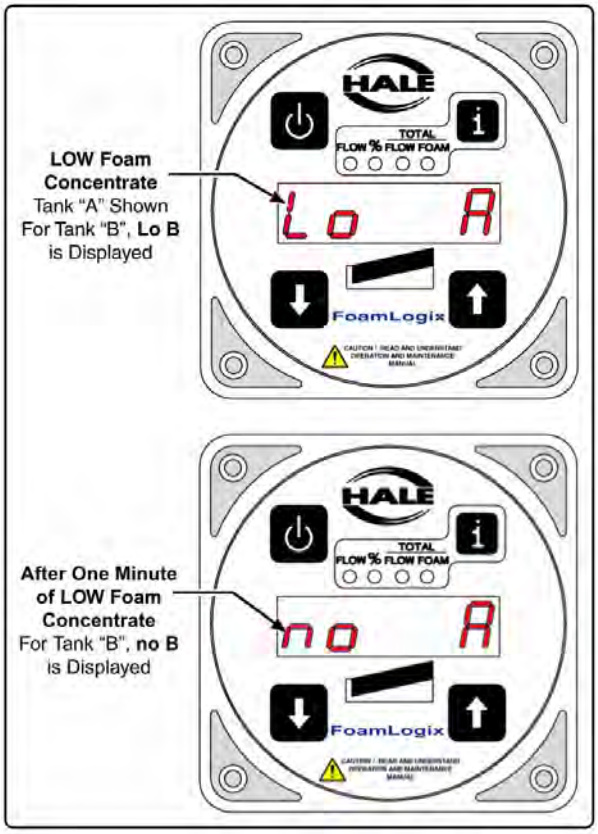


Figure 5-4: Low Foam Tank Message, Tank "A" Shown

If the **ON** button is pressed before refilling the foam tank, the system runs for approximately thirty (30) seconds before shutting down again.

Priming Message

(See Figure 5-5: "Priming, HIGH Temperature and LOW Battery Messages," on page 127.)

In the event there is no feedback signal being received when the foam pump starts, indicating a lack of foam concentrate flow, the foam pump motor runs at full speed attempting to establish foam concentrate flow.

If the system operates for a period of thirty (30) seconds without a feedback signal the system switches to the STANDBY mode and the display flashes **no Pr** (no prime), indicating there is no foam concentrate flow.

High Ambient Temperature Message

(See Figure 5-5: "Priming, HIGH Temperature and LOW Battery Messages.")

If the Hale FoamLogix system is operating in an environment of excessive ambient temperatures, the display shows **HIGH**.

If the circuitry in the Hale FoamLogix system is being affected by a drop in power supply voltage the display shows **Lo SP**.

> **Note:** This is not necessarily an indication of apparatus battery level or condition. It is only an indication of adverse system operating conditions. For instance, a bad battery cable can cause the system to see LOW power even though the batteries are fully charged.

In either case the system continues to run. If conditions deteriorate to the point of potential system damage, due to heat or low power, the system switches to the STANDBY mode and the error message remains until **ON** is pressed again.

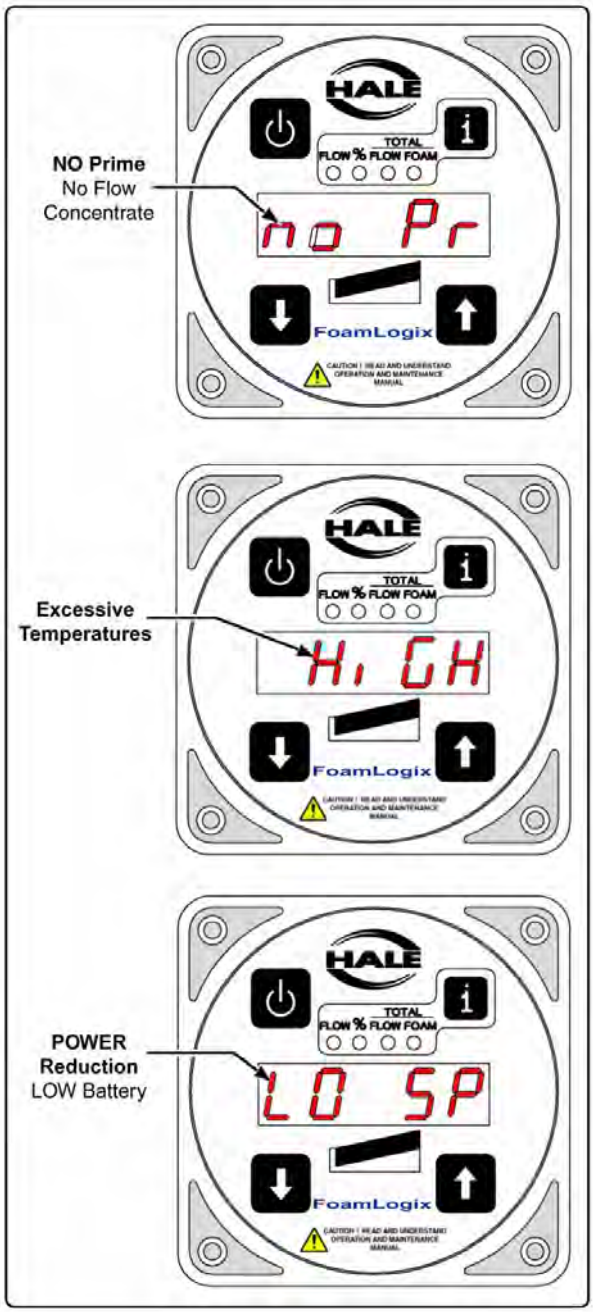


Figure 5-5: Priming, HIGH Temperature and LOW Battery Messages

5.7 PRIMING THE FOAM PUMP

When the Foam Tank Runs Dry

In some instances, the foam tank could run dry while operating the Hale FoamLogix system. When the fire pump is running the foam pump may not pump efficiently against 100 to 150 PSI (7 to 10 BAR) back pressure.

To re-establish foam concentrate flow quickly:

1. Turn the bypass valve to the **BYPASS** position.

2. With the fire pump flowing water from foam discharge and the Hale FoamLogix **ON**, observe the hose from the bypass valve.

3. When foam concentrate flows from the hose turn the bypass valve back to the **INJECT** position.

4. The pump is now primed and ready for normal operation.

5.8 NORMAL OPERATION SUMMARY

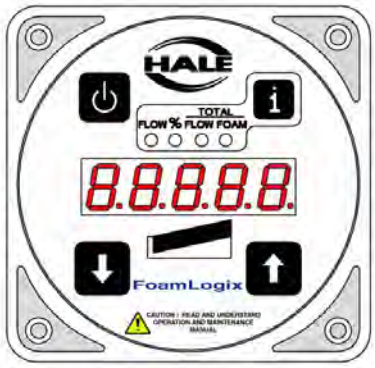
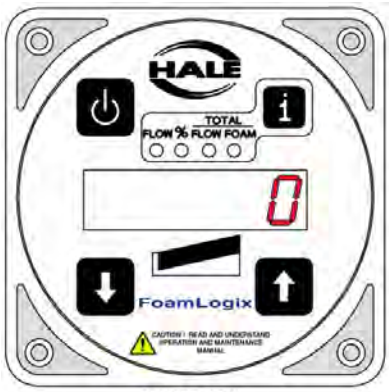
Operation	Action	Display
Energize System.	Energize the apparatus. The Hale FoamLogix enters initial start up and a brief self-diagnostic mode.	Initial Startup  Self-Diagnostics 
Select Foam Tank.	If system is equipped with dual foam tanks, place selector to proper tank.	 **STANDBY** Single Flow Sensor: Flow; Multiple Flow Sensors: % Flow

Figure 5-6: Normal Operation Summary Chart

Operation	Action	Display
Begin Foam Injection.	Establish water flow and press ON button.	 WATER FLOW Established ON Push Button is Pressed
Change Injection Rate. **Read Injection Rate.**	Press and HOLD ↑ and ↓ for two (2) seconds. Release once desired rate is set. Press and release ↑ or ↓. The display shows the injection rate and returns to the selected function after two (2) seconds.	 Foam Concentrate Injection Rate
Read Total Water or Foam Solution.	Press **i** until LED below TOTAL FLOW illuminates.	 Total Flow

Figure 5-6: Normal Operation Summary Chart

Operation	Action	Display
Read Total Foam Concentrate	Press **i** until LED below TOTAL FOAM illuminates.	 Total Foam
Reset Totalized Values	While in TOTAL FLOW or TOTAL FOAM, press and release ↑ or ↓.	
End Foam Injection	Press **ON**.	 **STANDBY** Single Flow Sensor: Flow Multiple Flow Sensors: % Foam

Figure 5-6: Normal Operation Summary Chart

5.9 SIMULATED FLOW MODE OPERATION

The Simulated Flow mode of the Hale FoamLogix system allows operation of the foam pump without discharging water through a foam capable discharge or when the flow sensor is not functioning. (See Figure 5-7: “Simulated Flow Display Sequence,” on page 132.)

The simulated flow mode is used to drain the foam tank for:

- ❑ Cleaning
- ❑ Checking calibration of the feedback sensor

- ❑ Verifying foam pump operation
- ❑ Manually controlling foam injection if the flow sensor malfunctions.

The factory default simulated flow rate is 150 GPM (568 LPM). The simulated flow rate and the concentrate injection percentage rate are set by the rate adjustment buttons on the control unit display, while in SIMULATED FLOW mode.

The simulated flow function provides manual operation of the foam injection system required by NFPA standards.

CAUTION !

WHEN OPERATING THE HALE FOAMLOGIX IN SIMULATED FLOW MODE AN OUTLET FOR THE FOAM CONCENTRATE MUST BE PROVIDED TO PREVENT EXCESSIVE PRESSURE BUILDUP IN DISCHARGE PIPING OR HOSES.

Simulated Flow Sequence

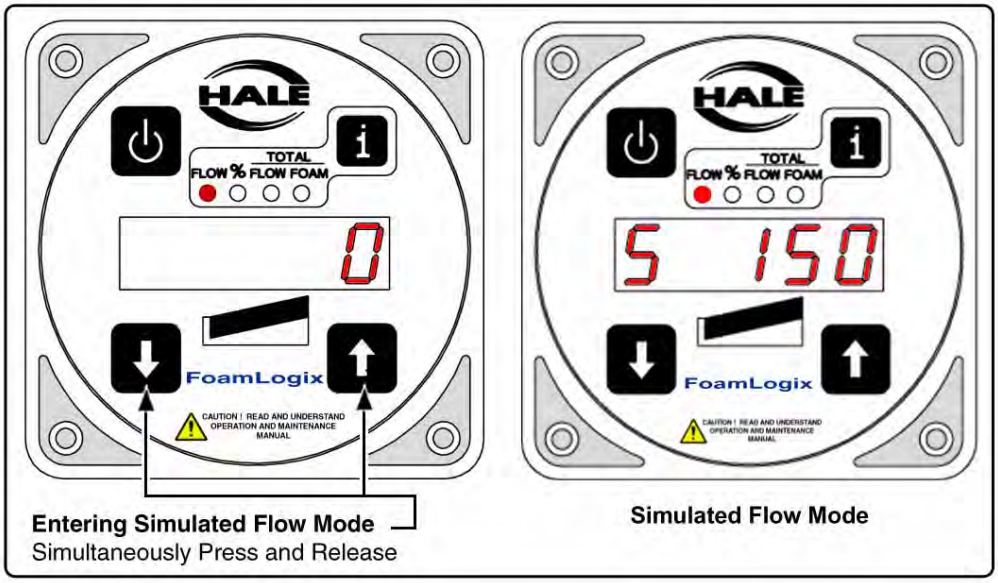


Figure 5-7: Simulated Flow Display Sequence

1. Uncoil and place the end of the bypass hose into a suitable container to collect the foam concentrate.

2. Place the BYPASS valve in the **BYPASS** position.

3. Energize the apparatus electrical system and press Hale FoamLogix DISPLAY button to turn **ON** the system.

4. The Hale FoamLogix enters the STANDBY mode. (See Chapter 4, Figure 4-7: “Simulated Flow Calibration,” on page 115.)

5. When the **FLOW** LED illuminates, press and release the ↑ and ↓ buttons simultaneously.

6. The display shows **S 150** (or other preset default value) and the **FLOW** LED illuminates. (See Figure 5-7: “Simulated Flow Display Sequence,” on page 132.)

7. Press the **ON** button. The left-most LED on the bar graph illuminates and the foam pump begins running.

8. Foam concentrate flows out of the end of the bypass hose.

To End Simulated Flow

a. Press the **ON** button to STOP the foam pump.

b. Press the DISPLAY button (**i**) button until the FLOW LED illuminates.

c. Press and release the ↑ and ↓ buttons simultaneously. The display shows the current water flow value and the FLOW LED illuminates.

d. De-energize the apparatus electrical system.

e. Place the bypass valve to the **INJECT** position.

f. Secure bypass hose in the appropriate compartment.

g. Return apparatus to normal ready condition.

5.10 DUAL TANK SYSTEM SELECTION

The following procedures are provided for operation with the Hale ADT or MDT II Selectors.

CAUTION !

UNLESS ENGAGED IN CLASS "B" FOAM OPERATIONS, THE HALE FOAM-LOGIX ADT TOGGLE SWITCH OR HALE FOAMLOGIX MDT II SELECTOR HANDLE MUST BE IN THE TANK "A" POSITION. IF THE TOGGLE SWITCH OR SELECTOR HANDLE IS IN THE FLUSH POSITION WHEN THE FOAM PUMP IS STARTED, THE FOAM PUMP RUNS FOR ONLY TWENTY (20) SECONDS, THEN SHUTS DOWN.

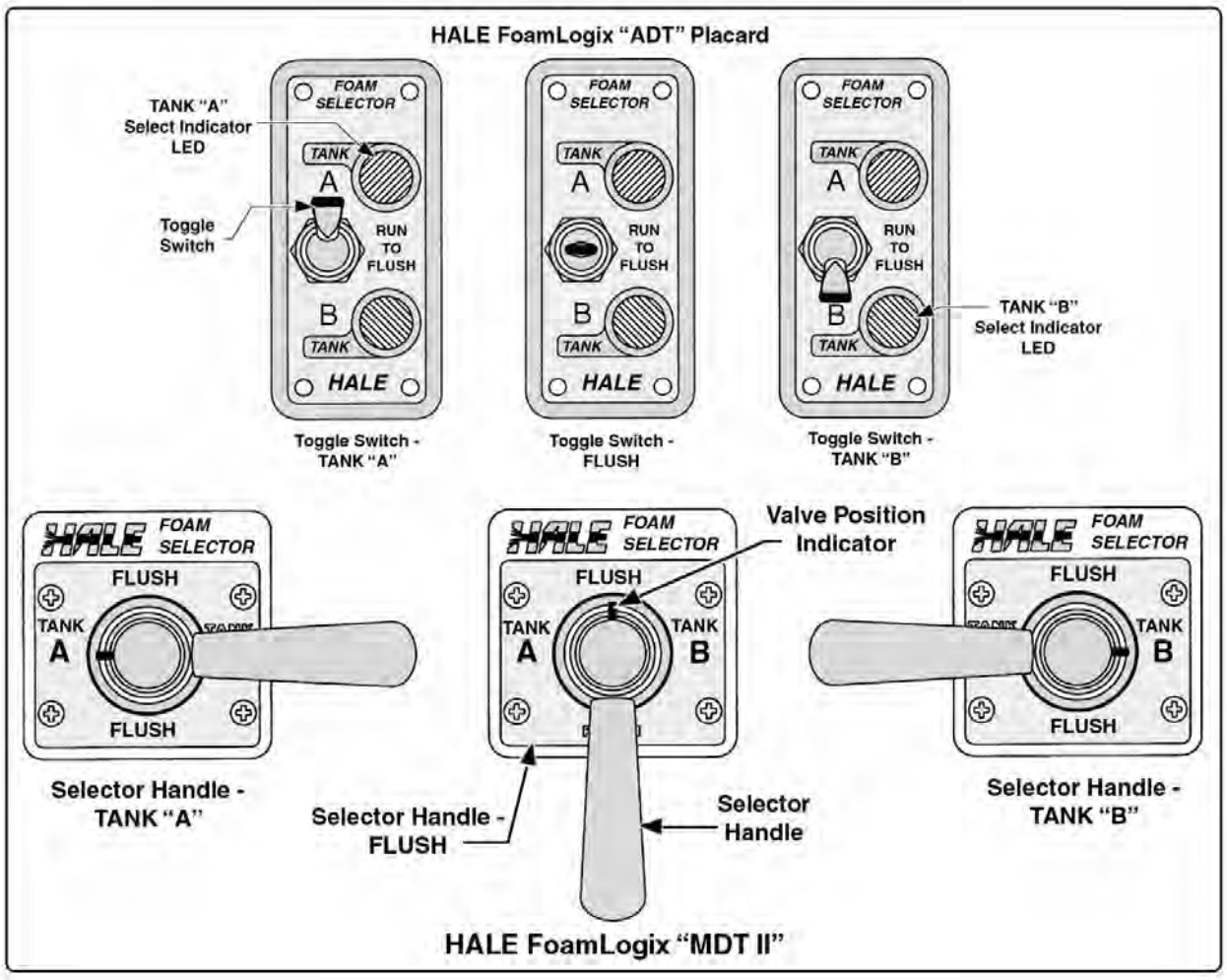


Figure 5-8: Dual Tank Selector Operating Positions

Make sure the Hale FoamLogix is operating and foam solution is being discharged. (See Figure 5-8: "Dual Tank Selector Operating Positions," on page 134.)

1. Set the Hale ADT toggle to the desired TANK, or turn the Hale Foam-Logix MDT II handle until the indicator points toward the desired TANK.

2. When changing toggle switch or selector handle position, move smoothly from the TANK “A” position through the FLUSH position to TANK “B” position in one motion without stopping. With the fire pump discharging water and the Hale FoamLogix operating, a small volume of water is provided to separate the two foam types helping to prevent possible adverse reactions.

3. After completion of Class “B” foam operations, briefly FLUSH the foam pump and return the Hale FoamLogix to the ready condition by returning to the TANK “A” position and flowing a small amount of Class “A” foam concentrate. (See Figure 5-8: “Dual Tank Selector Operating Positions,” on page 134.)

IMPORTANT !

MAKE SURE THE HALE FOAMLOGIX DUAL TANK SYSTEM IS IN THE TANK “A” POSITION WHEN APPARATUS IS PLACED IN THE READY CONDITION.

5.11 FLUSHING HALE FOAMLOGIX

When returning the apparatus to the ready condition after foam operations using Class “B” foam, the Hale FoamLogix foam pump must be FLUSHED. Some Class “B” foam concentrates deteriorate rapidly and residue cannot be left in the lines.

Note: Approved Class “A” foam concentrates do not deteriorate rapidly like Class “B” concentrates. As long as an approved Class “A” foam concentrate is used and the system is operated within 10-12 weeks no flushing is required. When Class “B” foam concentrate is used, always FLUSH the system, then switch back to Class “A.”

See Figure 5-8: “Dual Tank Selector Operating Positions,” on page 134. Also see Figure 5-9: “Hale MST Selector Operation” on page 136.

1. Energize the apparatus and establish water flow through a foam capable discharge. Set the fire pump for a LOW discharge pressure, 50 to 75 PSI (3.4 to 5.2 BAR).

2. Energize the Hale FoamLogix by pressing the **ON** push button, allowing foam solution to discharge.

Note: When the Hale ADT, MDT I I or MST is in the **FLUSH** position the Hale FoamLogix foam injection system runs for about twenty (20) seconds.

3. Place the Hale ADT, MDT II or MST to the **FLUSH** position. (See Figure 5-9: "Hale MST Selector Operation.")

4. Observe the discharge hose and allow Hale FoamLogix and discharge to run for several seconds.

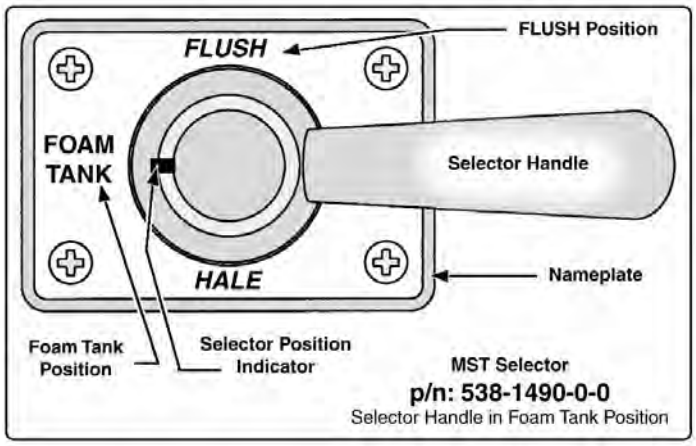


Figure 5-9: Hale MST Selector Operation

5. After several seconds place the Hale ADT or MDT II to the TANK "A" position and allow the system to run until all foam solution is discharged through the foam capable hose line.

Note: When the Hale MST is used for Class "B" foam concentrates DO NOT allow the foam pump to run in the **FOAM TANK** position after flushing foam pump.

6. Place the Hale MST to the **FOAM TANK** position and allow Hale FoamLogix to run until Class "A" foam solution is discharged through the foam capable hose line. If Class "B" foam concentrate is used, shut down Hale FoamLogix immediately after switching to the **FOAM TANK** position.

7. Shut down Hale FoamLogix allowing the foam capable discharge to continue to flush out the fire pump discharge manifold as required. Once clear water flows, close foam capable discharge and shut down the apparatus.

8. Perform required maintenance checks on the Hale FoamLogix and apparatus to return the apparatus to the ready condition.

IMPORTANT !

MAKE SURE THE HALE ADT OR MDT II IS IN THE TANK "A" POSITION AND THE HALE MST IS IN THE FOAM TANK POSITION WHEN APPARATUS IS PLACED IN THE READY CONDITION.

5.12 REMOTE ON/OFF SWITCH OPTION

The remote ON/OFF switch is used to activate the Hale FoamLogix system from the driver compartment or a location other than the control unit. The switch activates and deactivates the Hale FoamLogix system. It does not permit adjustment of the injection rate.

(See Section 3, Figure 3-41: “Remote Activation Switch Installation Dimensions,” on page 100.)

To operate:

1. Press the switch down and release to activate. The LED illuminates, indicating the Hale FoamLogix is in the STANDBY mode. (See Figure 5-10: “Remote Activation Switch.”)

2. When the foam capable discharge nozzle is opened the LED BLINKS, indicating foam concentrate is being injected. When the nozzle is closed the LED stops flashing.

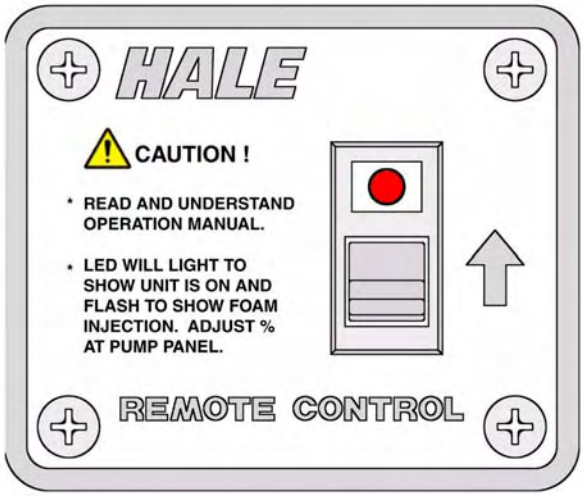


Figure 5-10: Remote Activation Switch

3. Pressing the switch again deactivates the Hale FoamLogix system and the LED shuts OFF. (See Figure 5-10: “Remote Activation Switch.”)

Notes

6 Maintenance

6.1 MAINTENANCE PROCEDURES

After each use

1. Inspect wiring, hoses, flow sensors and connections for tightness, corrosion, leaks and/or damage. See heading “System Plumbing Diagrams” on page 77. Also see heading “Electrical” on page 85.

2. Flush the foam pump if a non-approved foam concentrate is used. Also see heading “Appendix A: Foam Concentrate Compatibility” on page 149.

Monthly

Verify water flow calibration.

Every Two (2) Months

If an approved foam concentrate has been left in the system, operate the FoamLogix system to move the foam concentrate and prevent jelling.

Annually

Verify foam feedback calibration.

Notes

7 Troubleshooting

7.1 USER DIAGNOSTICS

Power indicator LEDs are provided on the distribution box and on the feedback sensor and illuminate when power is supplied to the FoamLogix system. (See Figure 7-1: “Distribution Box Overview.”) The LED on the feedback sensor FLASHES when the feedback sensor is receiving pulses from the flow sensor. These LEDs help to ease tracing of power supply faults and eliminates some of the guesswork in troubleshooting.

If the system malfunctions make sure ALL the following conditions are checked:

- ❑ All hose connections are correct and tight. (See Section 3.5, “System Plumbing Diagrams,” on page 77 for more information.)
- ❑ All electrical connections correct and tight.
- ❑ Apparatus electrical system is energized with power supplied to pump panel and Hale FoamLogix.

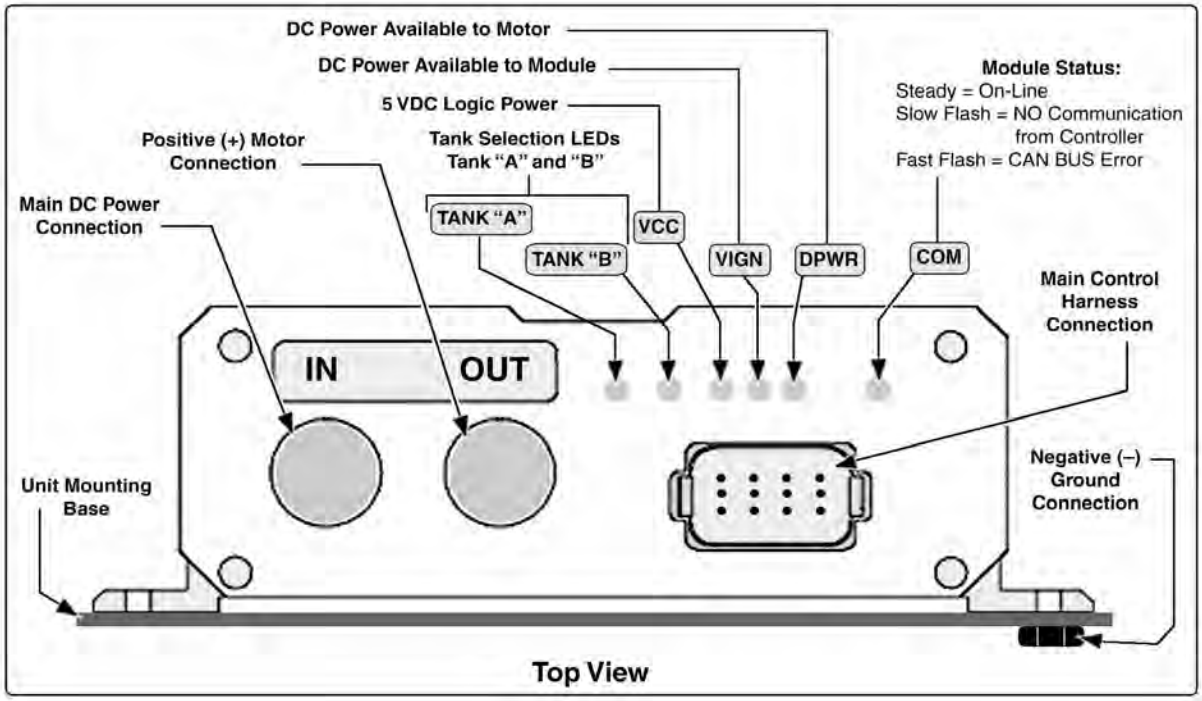


Figure 7-1: Distribution Box Overview

- ❑ Hale FoamLogix is activated by pressing the power push button (**i**) on the control display unit. (See Figure 5-1: “Control Unit Identification,” on page 121.)

Once all the above conditions are met proceed to the system troubleshooting section to determine cause of malfunction.

NOTE: Hale FoamLogix system electronic components have no user serviceable components inside and are replaced as a unit. **Opening of Hale FoamLogix electronic components voids the manufacturer’s warranty.**

7.2 SYSTEM OVERVIEW

(See Figure 7-2: “FoamLogix, Closed Loop Flow Diagram.”)

Hale FoamLogix systems consist of individual subsystems working together to provide finished foam solution at the proper percentage. The system is designed using modular components simplifying troubleshooting and repair.

The FoamLogix 3.3, 5.0 or 6.5 is a “closed-loop” system. The brains behind the system is the computer-controlled FoamLogix Control Display Unit. As an electronic system, the flow of data “runs” the system.

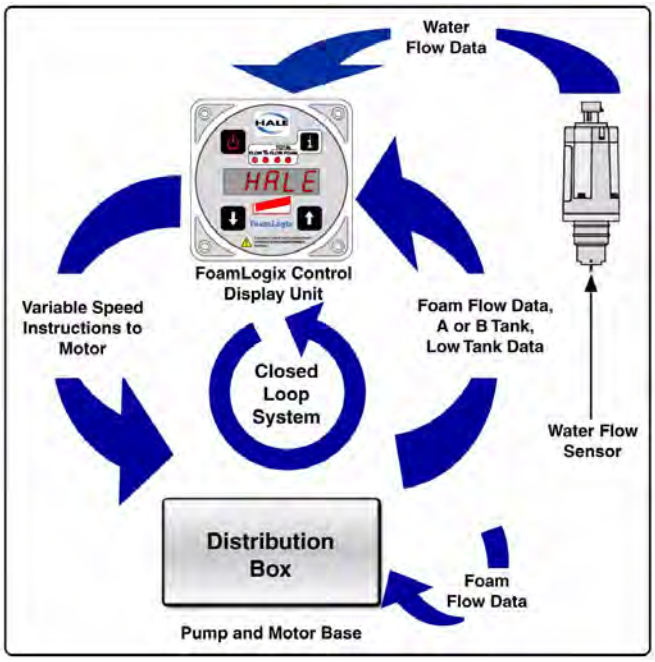


Figure 7-2: FoamLogix, Closed Loop Flow Diagram

Water flow data is fed to the control unit. Since the injection rate (%) is preset, the control unit calculates the required motor speed for the foam pump and sends this data to the motor. The output of the pump is measured by a foam flow feedback sensor.

The foam flow feedback sensor tells the control unit how much foam is actually pumped so the control unit can make the required motor speed adjustments. This “closed-loop” runs several times per second for optimum accuracy.

Note: The FoamLogix system has a SIMULATYED FLOW function. (See Section 5.9, “Simulated Flow Mode Operation,” on page 131 for more information.) This allows troubleshooting without flowing water.

Distribution Box

The Distribution Box, part of the pump/motor assembly, sends data to the control unit for LOW tank warnings, TANK A or B selection status, as well as foam concentrate flow feedback.

Selector valves are connected to the main cable harness and provide the appropriate data to the control unit, i.e., is the unit in TANK select or FLUSH mode.

Note: If no accessory is used, a connector plug is installed to lock the system in the TANK A mode. For cable harness overviews, see Section 9 “Plate Drawings,” beginning on page ? Removing this plug or disconnecting the MST accessory cable places the system in the FLUSH mode.

Pump / Motor

The discharge of the foam pump directs foam to the rotary lobe flow meter.

The rotors are a composite material containing small stainless steel targets. As the foam is being pumped, a target lines up with the sensor in the pump head. The sensor “sees” the target and sends this signal to the control unit, through the distribution box.

An indicator lamp on the sensor FLASHES as the target passes the sensor. Depending on how much foam is being pump determines the flashing speed, which could be so fast that the indicator light actually appears to be constant.

Bar Graph

The bar graph, on the control display unit, indicates the system capacity by illuminating LEDs form right-to-left, and is a good troubleshooting tool.

If the controller does not see foam feedback data, indicating foam is being pumped, the all bar graph LEDs FLASH. The control unit then increases pump speed attempting to prime the pump and achieve the proper foam concentrate flow.

If the control unit does not receive data that foam concentrate is flowing, it displays the "**No Pri**" error message, indicating no prime, and turns the system OFF. Pressing ON starts the cycle again. There must be water flow or the unit must be in the simulated flow mode. (See Section 5, "Operation," on page 121 for more information.)

Summary

FoamLogix replacement parts are "plug-and-play" type devices that do not require specialized equipment to service. Normal water flow and foam calibration is usually necessary after a major component service.

The procedures that follow provide a logical flow path to isolate and correct system failures.

7.3 PROBLEM ISOLATION

The first step in troubleshooting is to determine which subsystem caused the system failure. Operate the apparatus and Hale FoamLogix system in accordance with standard operating procedures and isolate where the problem occurs.

Use the troubleshooting charts (See Chart 7-3: "Hale FoamLogix System Troubleshooting Flow Chart," on page 146.), together with Chart 7-4: "Power System Troubleshooting," on page 147, to diagnose or trace a field problem to a particular component – repair and/or replace accordingly.

Also review the following steps.

1. Setup the apparatus for normal operation.

2. Power-up the apparatus and energize the pump operator panel.

   Take notice of the Hale FoamLogix control unit. If the display is NOT illuminated proceed to Chart 7-3: "Hale FoamLogix System Troubleshooting Flow Chart," on page 146.

3. If the Hale FoamLogix control unit is illuminated, engage the apparatus water pump and establish discharge.

   If water flow CANNOT be established, troubleshoot the water pump system.

4. If there is no indication of water flow on the control unit display troubleshoot the flow sensor.

5. If water flow is established, turn the Hale FoamLogix system ON to flow foam.

6. Observe foam pump discharge. If foam is NOT flowing troubleshoot the foam pump.

7. Check accuracy of system using the calibration procedures and making adjustments as required. (See Section 4.2, “User Calibration,” on page 111 for more information.)

   - ❑ **Do Not** remove or alter any hydraulic or pneumatic connections, electrical devices, etc.
   - ❑ **Do Not** tamper with or disconnect safety features or modify protective guards (such as covers or doors).
   - ❑ **Do Not** add or remove structural parts. *Doing so voids the warranty.*



WARNING !

ANY OF THE ABOVE COULD AFFECT SYSTEM CAPACITY AND/OR SAFE OPERATION OF THE SYSTEM AND IS A SERIOUS SAFETY VIOLATION WHICH COULD CAUSE PERSONAL INJURY, COULD WEAKEN THE CONSTRUCTION OF THE SYSTEM OR COULD AFFECT SAFE OPERATION OF THE FOAMLOGIX PROPORTIONING SYSTEM.

7.4 FLOW CHARTS

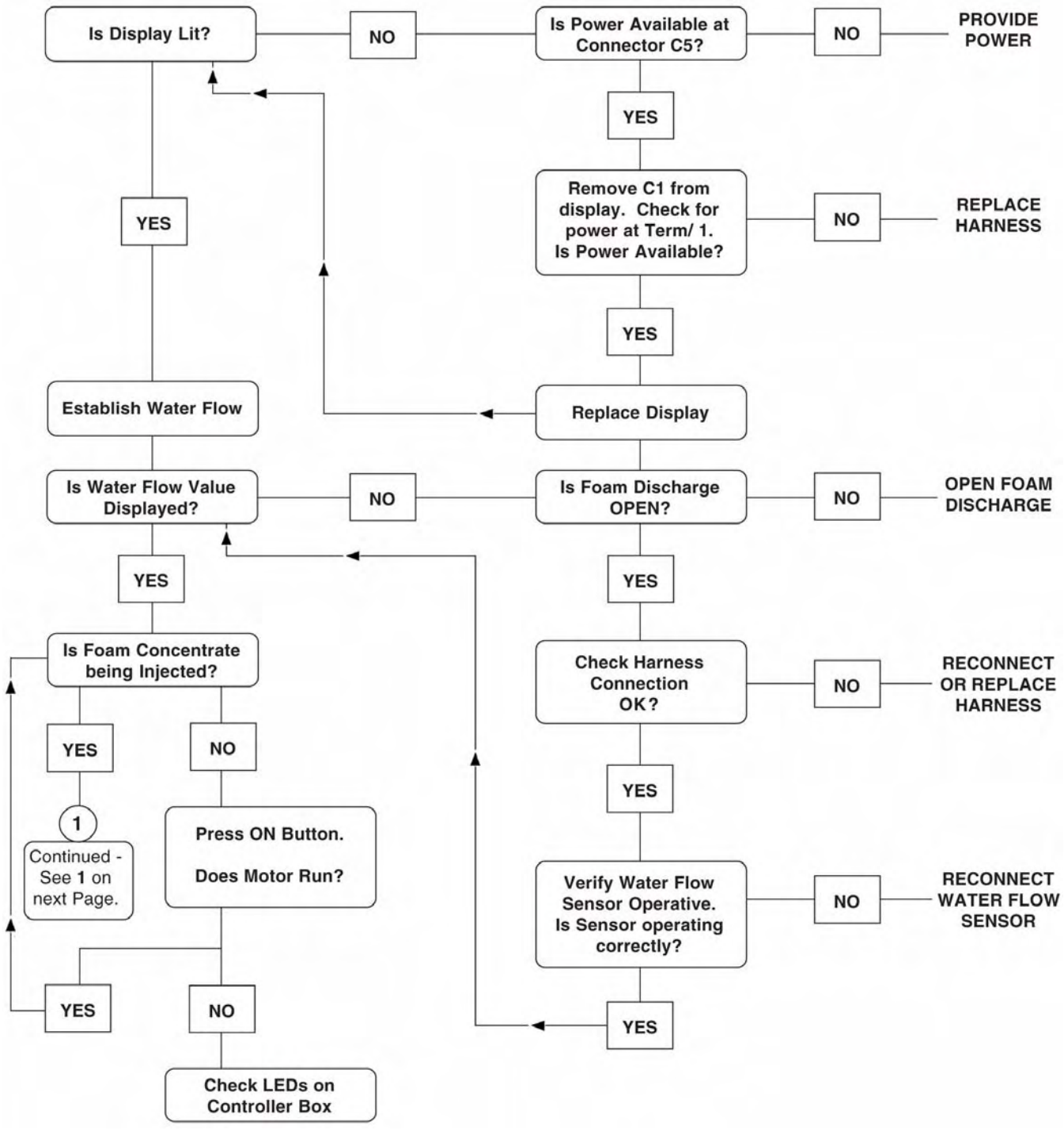


Chart 7-3: Hale FoamLogix System Troubleshooting Flow Chart

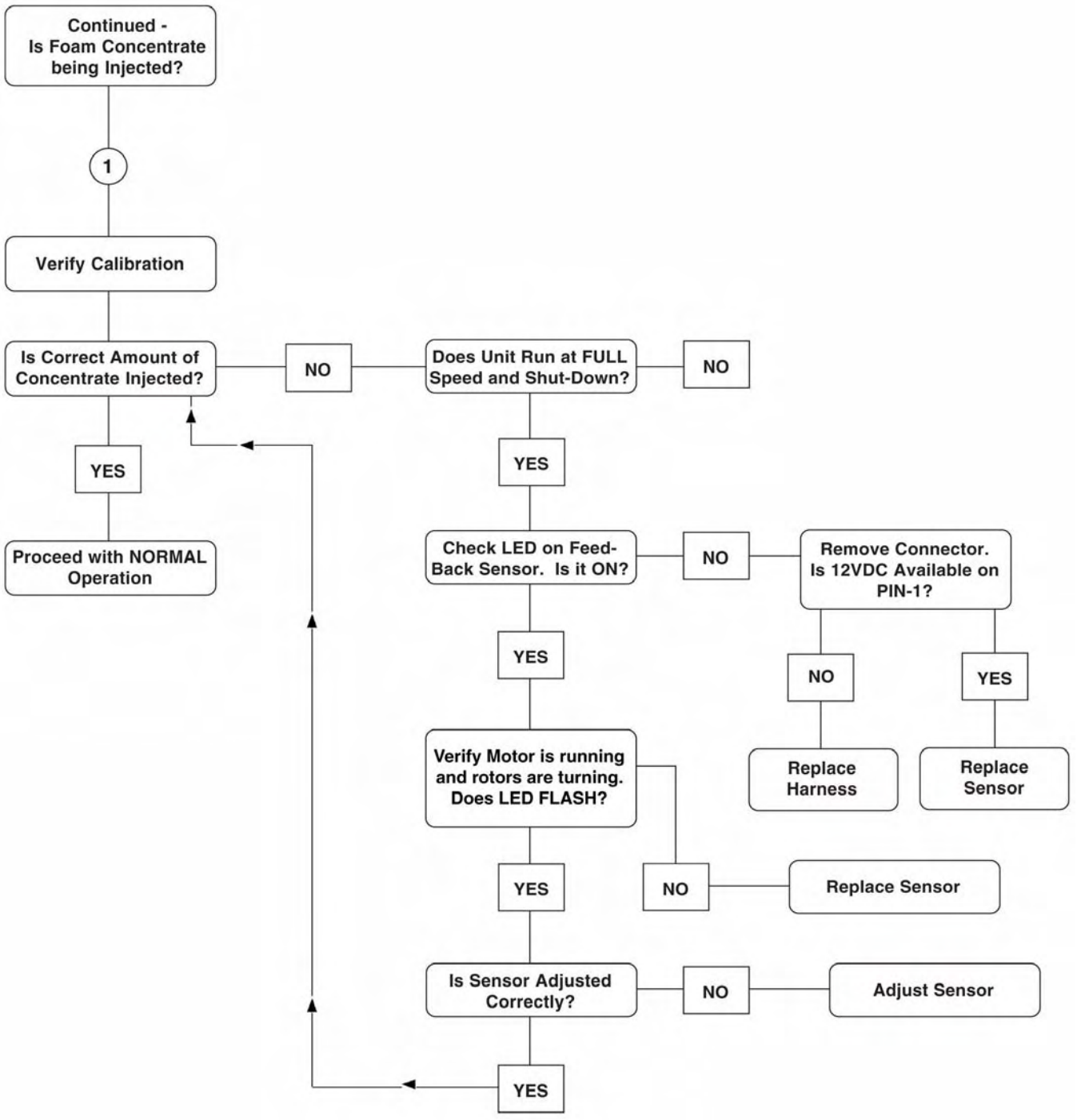


Chart 7-4: Power System Troubleshooting

Notes

Appendix A: Foam Concentrate Compatibility

The following foam concentrates are approved for use in Hale Foam Proportioning Systems. The Class "A" foam concentrates are approved for use in all Hale Foam Proportioning Systems (i.e., Hale FoamLogix 5.0, 3.3, 2.1 and Hale V Series).

Type of Foam Concentrate	Manufacturer	Brand Name
CLASS "A" FOAM		
US Forestry Service **Approved Reference * and ****	Ansul	Silvex Class "A" Foam Concentrate
	Kidde Fire Fighting / National Foam	ForeXpan S (0.1% - 1.0%)
	Kidde Fire Fighting / National Foam	Hi Combat Class "A" 91st Defense Class "A" Cold Water Foam)
Note: **This list of compactible foam concentrate is updated regularly.** **For latest information see www.haleproducts.com.**	Kidde Fire Fighting / National Foam	Knock-Down
	Monsanto	PhosCheck WD881
	Chemonics	Fire-Trol Fire Foam 103
	Chemonics	Fire-Trol Fire Foam 104
	3M	Light Water FT-1150
* For use in FoamLogix Model 5.0, 3.3, 2.1 and Hale V-Series. ** USFS approved foams have been tested for corrosion and biodegradability toxicity by the US Forest Service in addition to the Hale testing described on page 151.		
Non US Forestry Service Approved **Reference ***	Chemguard	Class "A" Plus
	Unifoam Co. Lid.	UniA 1%
	3M	Light Water SFFF
	Kidde Fire Fighting / National Foam	Responder
	Kidde Fire Fighting / Angus Foam	FirePower Class "A"

Chart A-1: Hale Class "A" Foam Concentrate Compatibility

Type of Foam Concentrate	Manufacturer	Brand Name
CLASS "B" FOAM * The Class "B" Foam, Specialty foam and Fire Fighting Additive Concentrates are approved for use in FoamLogix Models 5.o and 3.3 Foam Proportioning System only.		
AFFF - Alcohol Resistant Concentrate **Reference *** **Note: This list of compactible foam concentrate is updated regularly. For latest information see www.haleproducts.com.**	3M	3% Alcohol Type AFFF Concentrate (p\n: 98-0211-6573-7)
	Ansul	3 x 3 Low Viscosity Alcohol Resistant Concentrate
	ChemGuard	AR 3% - 6% (p/n: CAR36P)
	ChemGuard	Ultraguard 1% - 3% (p/n: C-133)
	ChemGuard	AR-AFFF 3% x 3% (p/n: C-333)
	Kidde Fire Fighting / Angus Foam	Alcohoseal 3 x 3
	Kidde Fire Fighting / Angus Foam	Universal Gold 3% AR-AFFF
	Kidde Fire Fighting / Angus Foam	Universal Gold, 1% - 3% AR-AFFF
	US Foam	1% 03% Alcohol Resistant AFFF (p/n: US-AR13)
	US Foam	1% - 3% Alcohol Resistant AFFF (p/n: US-FCAR36)
AFFF	Kidde Fire Fighting / National Foam	1% Aero-Water
SPECIALTY FOAM CONCENTRATES		
Protein	Kidde Fire Fighting / National Foam	Terra Foam 3% CF
	Chemonics	Durra Foam 3%
FIRE FIGHTING WATER ADDITIVE		
	Hazard Control Technologies Inc.	F-500 (1%, 3%, 6%)
	SPL Control LLC	Pyrosolv (FF Agent - 6% Solution (p/n: 72038, MSDS#)

Chart A-2: Hale Class "B" Foam Concentrate Compatibility

Reference

The preceding foam concentrates have been tested by Hale Products to ensure compatibility with Hale FoamLogix models 5.0 and 3.3 Foam Proportioning Systems. These chemicals were run for several hundred hours over several months to make sure they do not harm the Foam System. This list is solely intended to assist the end user in selection of foam concentrate(s) compatible with a Hale FoamLogix Model 5.0 and 3.3 and is not a determination of the fire fighting effectiveness of one product over another.

Always consult with NFPA standards, U.L. Listings, Federal, State, and local regulations pertaining to application and environmental regulations before selecting a foam concentrate. (Refer to FoamLogix User Manual for additional information.)

Many fire fighting foam chemical manufacturers have specific instructions on handling and use of their products including, but not limited to, shelf life, tank life, and intervals between use. Always follow manufacturer's instructions for use.

This Appendix applies to Hale FoamLogix foam pumps built after April 17, 1997. For Hale FoamMaster foam pumps built prior to April 17, 1997, refer to Bulletin 650, Rev-2.

If a particular foam concentrate you wish to use does not appear on this list, please contact your Hale representative for information concerning compatibility with Hale FoamLogix Model 5.0 or 3.3 Foam Proportioning Systems. As further testing is completed, Hale Products Inc. updates this list and expands capabilities and features to keep the Hale FoamLogix the best system available for all fire fighting.

Revised 02/10/2005



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Express Warranty

EXPRESS WARRANTY: Hale Products, Inc. (HALE) hereby warrants to the original Buyer that products manufactured by Hale are free of defects in material and workmanship for one (1) year. The "Warranty Period" commences on the date the original Buyer takes delivery of the product from the manufacturer.

LIMITATIONS: Hale's obligation is expressly conditioned on the Product being:

- Subjected to normal use and service.
- Properly maintained in accordance with Hale's Instruction Manual as to recommended services and procedures.
- Not damaged due to abuse, misuse, negligence, or accidental causes.
- Not altered, modified, serviced (non-routine) or repaired other than by an Authorized Service Facility.
- Manufactured per design and specifications submitted by the original Buyer.

THE ABOVE EXPRESS LIMITED WARRANTY IS EXCLUSIVE. NO OTHER EXPRESS WARRANTIES ARE MADE. SPECIFICALLY EXCLUDED ARE ANY IMPLIED WARRANTIES INCLUDING, WITHOUT LIMITATIONS, THE IMPLIED WARRANTIES OF MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE OR USE; QUALITY; COURSE OF DEALING; USAGE OF TRADE; OR PATENT INFRINGEMENT FOR A PRODUCT MANUFACTURED TO ORIGINAL BUYER'S DESIGN AND SPECIFICATIONS.

EXCLUSIVE REMEDIES: If Buyer promptly notifies HALE upon discovery of any such defect (within the Warranty Period), the following terms shall apply:

- Any notice to HALE must be in writing, identifying the Product (or component) claimed defected and circumstances surrounding its failure.
- HALE reserves the right to physically inspect the Product and require Buyer to return same to HALE's plant or other Authorized Service Facility.
- In such event, Buyer must notify HALE for a Returned Goods Authorization Number and Buyer must return the product F.O.B. within thirty (30) days thereof.
- If determined defective, HALE shall, at its option, repair or replace the Product, or refund the purchase price (less allowance for depreciation).
- Absent proper notice *within* the Warranty Period, HALE shall have no further liability or obligation to Buyer therefore.

THE REMEDIES PROVIDED ARE THE SOLE AND EXCLUSIVE REMEDIES AVAILABLE. IN NO EVENT SHALL HALE BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGE INCLUDING, WITHOUT LIMITATION, LOSS OF LIFE; PERSONAL INJURY; DAMAGE TO REAL OR PERSONAL PROPERTY DUE TO WATER OR FIRE; TRADE OR OTHER COMMERCIAL LOSSES ARISING, DIRECTLY OR INDIRECTLY, OUT OF PRODUCT FAILURE.



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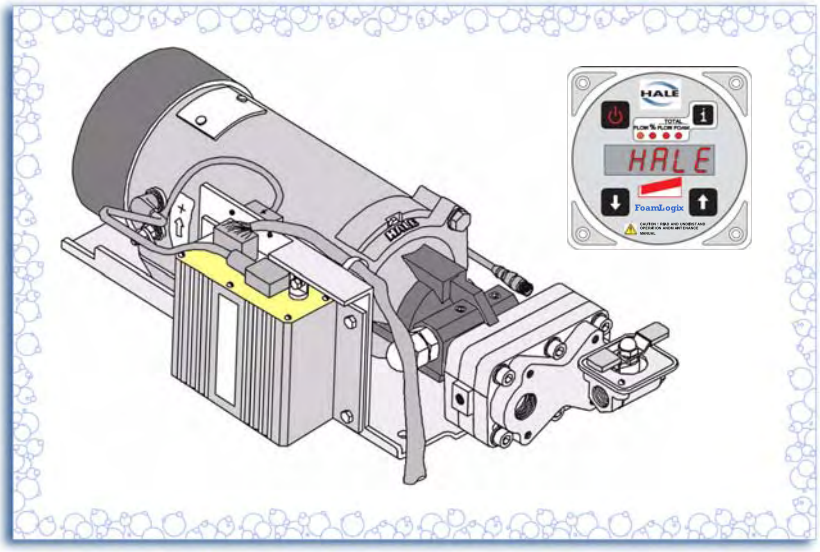




FoamLogix™

Models 3.3, 5.0 and 6.5 Electronic Foam Proportioning System

Parts Identification and Drawing Package



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IDEX CORPORATION · Class 1 · GODIVA · HURST JAWS OF LIFE · LUKAS · HALE PRODUCTS INC. ISO 9001 Certificate A4026

Manual p/n: 029-0021-68-0

APPARATUS INFORMATION

ENGINE _____

TRANSMISSION _____

MAXIMUM CAFS ENGINE RPM _____

CAFS ENGINE SPEED RANGE _____



NOTICE !

Class1 cannot assume responsibility for product failure resulting from improper maintenance or operation. Class1 is responsible only to the limits stated in the product warranty. Product specifications contained in this manual are subject to change without notice.

All Class1 products are quality components -- ruggedly designed, accurately machined, precision inspected, carefully assembled and thoroughly tested. In order to maintain the high quality of your unit, and to keep it in a ready condition, it is important to follow the instructions on care and operation. Proper use and good preventive maintenance will lengthen the life of your unit.

ALWAYS INCLUDE THE UNIT SERIAL NUMBER IN YOUR CORRESPONDENCE.

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8 Illustrated Parts Breakdown

GENERAL

This section contains the parts breakdown for the serviceable assemblies, components and most commonly used options for the **FoamLogix 3.3 / 5.0 and 6.5** Electronic Foam Proportioning System.

ABBREVIATIONS

The following abbreviations may be used in this IPB:

A/R ..... As required
Cm ..... Centimeters
Cont. ..... Continued
Dia. ..... Diameter
EMI ..... Electro-Magentic Interference
Ext. ..... Exrternal
FNPT ..... Fine National Pipe Thread
Fwd ..... Forward
Ga ..... Gauge
Grd, Gr ..... Grade – when hardware lists a grade rating, it is imperative to maintain that rating when replacing parts.
Hp, HP ..... Horsepower
HS ..... Hardened Steel
Hex ..... Hexagonal
Id, ID ..... Inner diameter
IPB ..... Illustrated Parts Breakwown
JIC ..... Joint Industry Conference – an industry standard used to describe a fitting.
Kw (kw) .... Killowatt
Lh, LH ..... Left Hand
Max. ..... Maximum
Min. ..... Minimum
MM ..... Millimeters
Mtg ..... Mounting
n/s ..... Not Shown – parts that are not shown but are servicable.
No ..... Number
NFPA ..... National Fire Protection Agency
NPT ..... National Pipe thread
NPTF ..... National Pipe Thread, Fine
OD ..... Outer diameter
p/n ..... Part number
Ref ..... Reference
Rev ..... Reverse
Rh, RH ..... Right hand
RFI ..... Radio Frequency Interference
Str ..... Straight – usually to describe a hy-draulic or pneumatic fitting (vs. elbow)
Thru ..... Through
Typ. ..... Type

8.1 AIR DUAL TANK VALVE (ADT) OPTION

Item	Part No.	Qty.	Description
	538-1610-00-0	1	ADT Selector Panel Assembly, Includes items below marked with an asterisk (*)
	538-1640-00-0	1	ADT Valve Assembly, Includes items below marked with a plus (+)
*1	101-1630-00-0	1	ADT Nameplate)
*2	200-0540-00-0	1	Light Assembly, Green
*3	038-1800-00-0	1	Toggle Valve
*4	200-0540-10-0	1	Light Assembly, Red
5	507-0380-00-0	1	Air Harness Assembly, Optional
+6	082-0545-05-0	1	Elbow, Nylon, 3/4” NPT x 1” (25.4 mm) Hose (not shown)
7	040-1180-00-0	1	Seal Ring, 40-30N 118
8	040-1230-00-0		O-Ring Seal, Buan 123
9	101-1631-07-0	1	Nameplate, foam Master system Diagram, Dual Tank
+10	082-0521-05-0	1	Elbow, Nylon, 3/4” NPT x 3/4” (19 mm) Hose
			(not shown)
11	538-1640-01-0		ADT Valve Assembly
*12	082-0143-02-0	2	Elbow, 18” NPT x 1/4” (6.1 mm) Tube Push Connect
*13	082-0142-02-0	1	Fitting, 18” NPT x 1/4” (6.1 mm) Tube Push Connect
*14	513-0300-00-0	1	ADT Wire Harness
+15	018-1410-24-0	4	Screw,5/6”-18 x 1”
+16	012-1430-00-0	1	Knob, Pull-to-Bypass
+17	200-2450-00-0	2	Switch
+18	010-0660-00-0	1	Strainer, In-Line
+19	082-0408-02-0	1	Close Nipple, Brass, 1/2” NPT
+20	082-0414-02-0	1	Service Elbow, Brass, 1/2” NPT

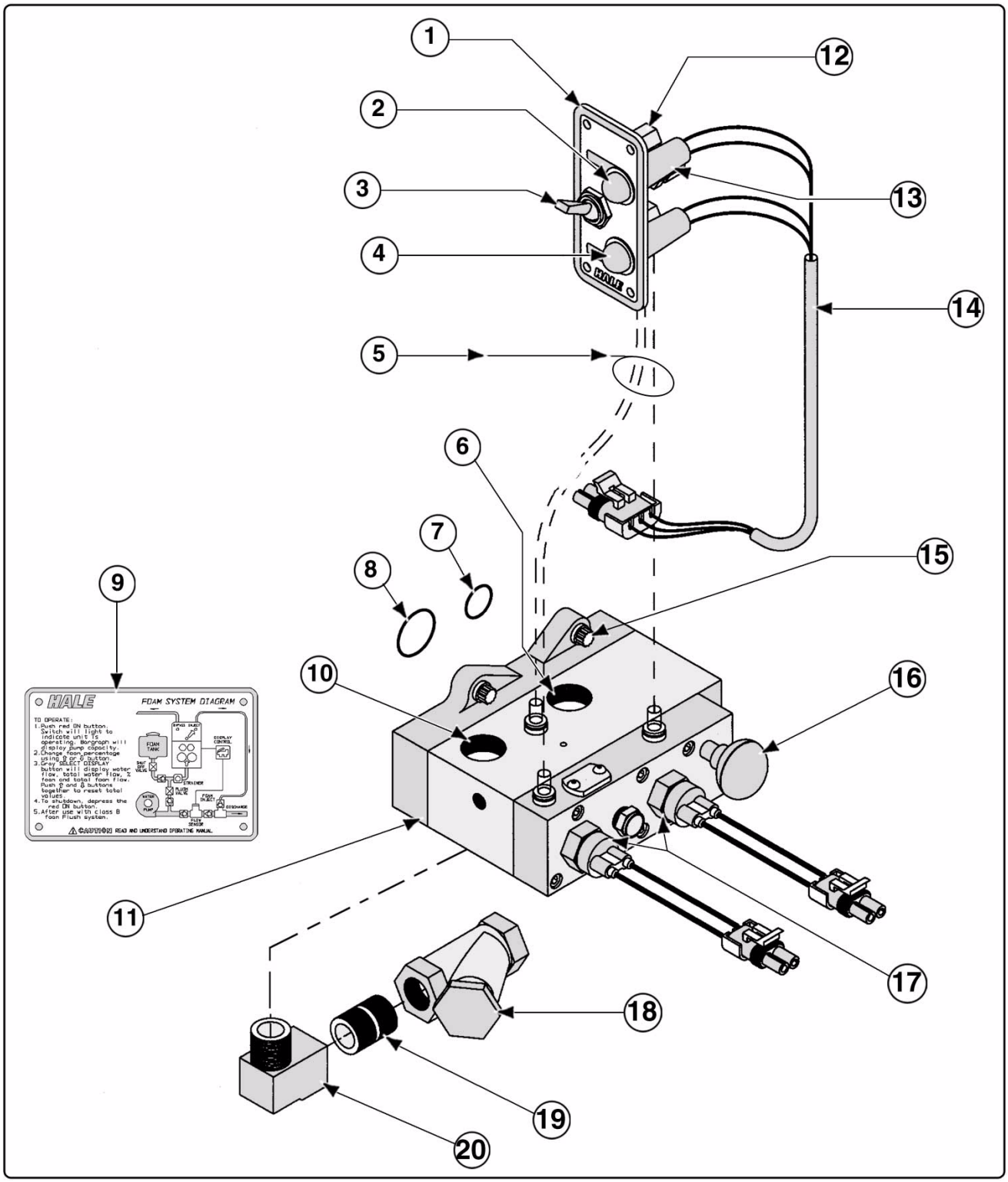


Figure 8-1: Air Dual Tank Valve Option

8.2 HARNESS COMPONENTS

Item	Part No.	Qty.	Description
1	513-0320-23-0	1	Tank Select Plug
2	513-0270-04-0	1	Display Power Connection, 12” (305mm) Long, Wiring Harness)

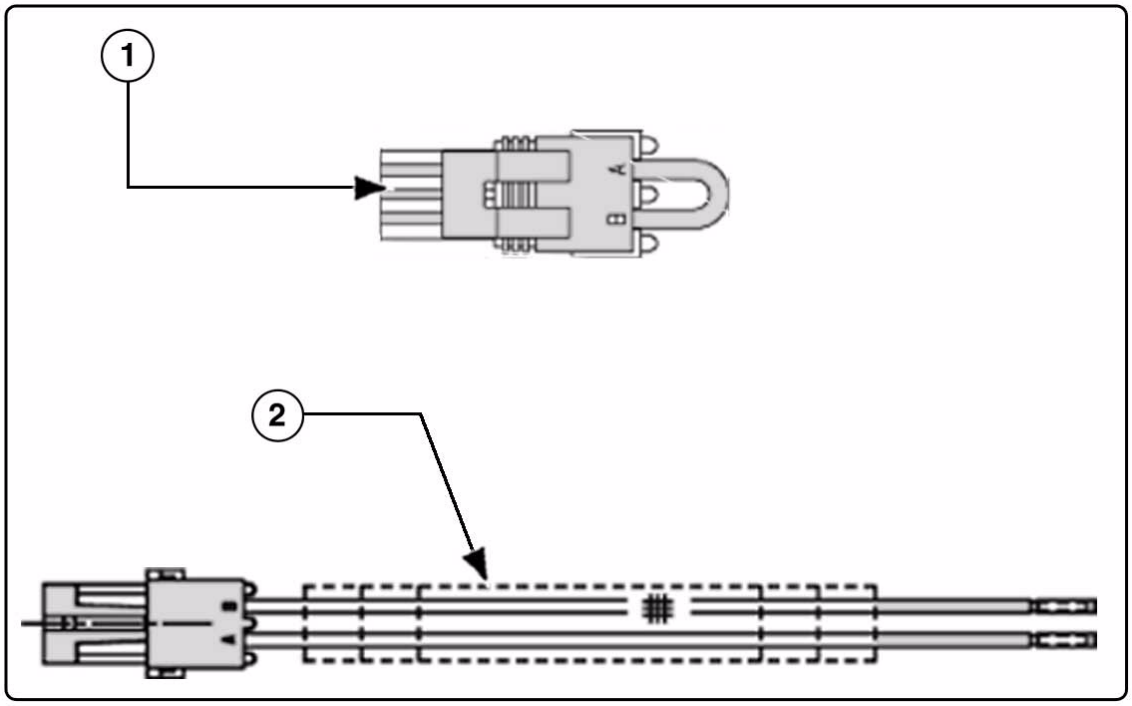
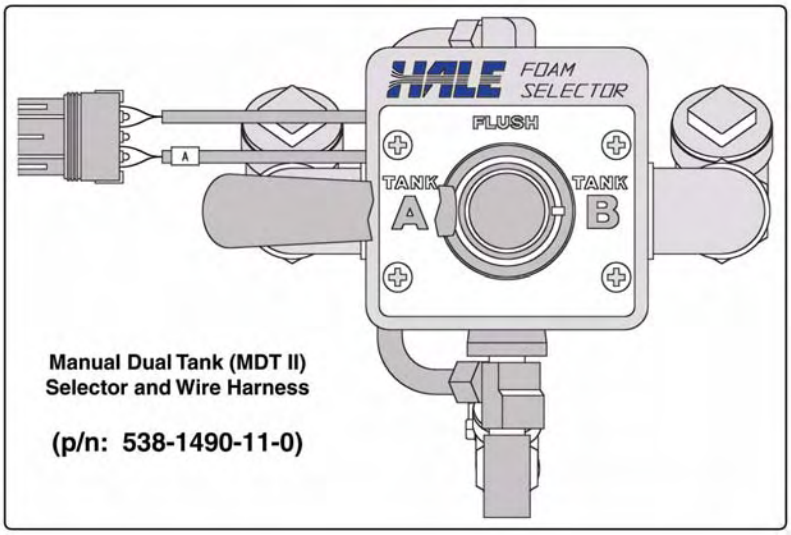


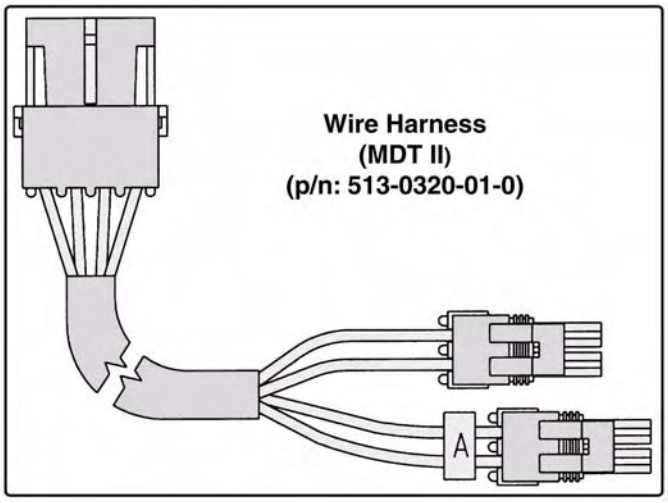
Figure 8-2: Harness Components

8.3 DUAL FOAM CONCENTRATE TANK OPTIONS

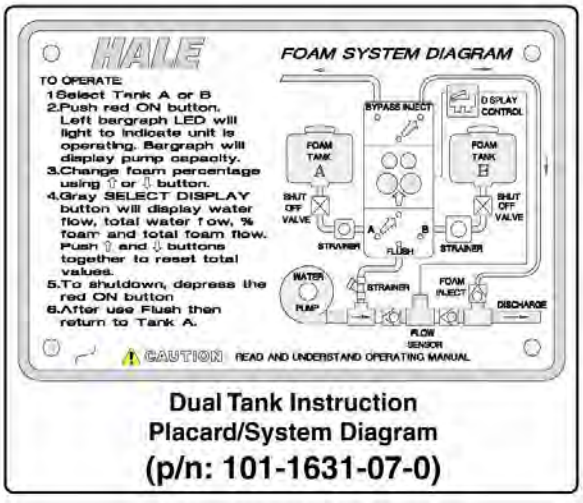


Manual Dual Tank (MDT II)
Selector and Wire Harness

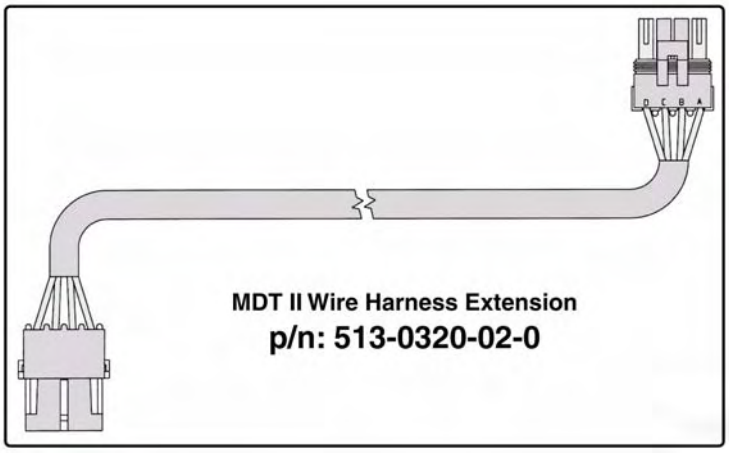
(p/n: 538-1490-11-0)



Wire Harness
(MDT II)
(p/n: 513-0320-01-0)

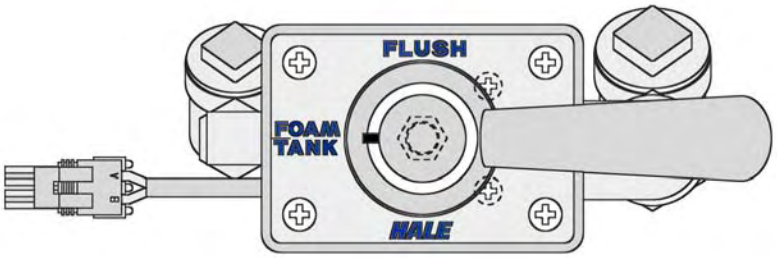


Dual Tank Instruction
Placard/System Diagram
(p/n: 101-1631-07-0)

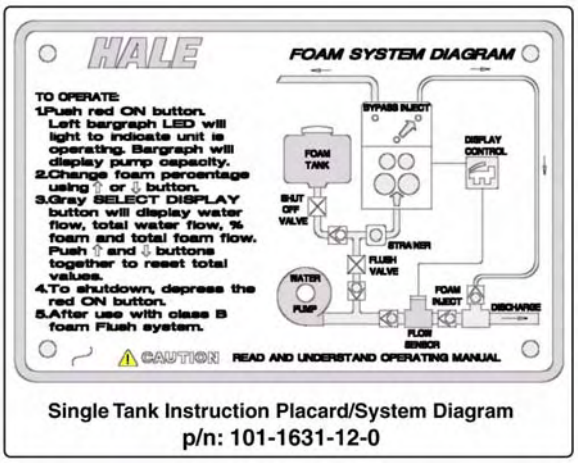


MDT II Wire Harness Extension
p/n: 513-0320-02-0

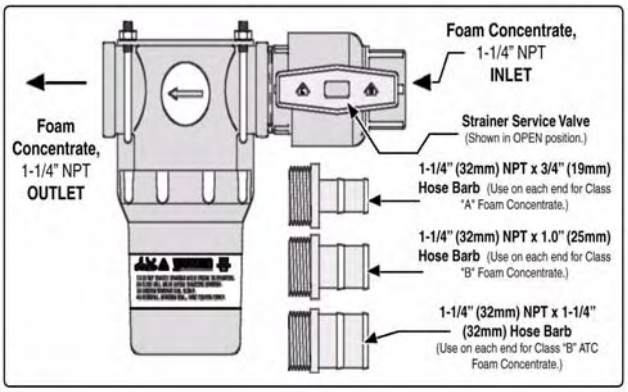
8.4 SINGLE FOAM CONCENTRATE TANK OPTIONS



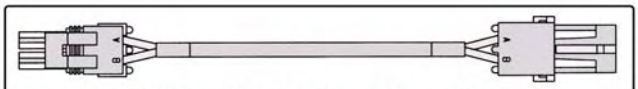
Manual Single Tank (MST) Selector
Provides Foam Pump Flushing Capabilities for a Single Tank System
(p/n: 538-1490-12-0)



Single Tank Instruction Placard/System Diagram
p/n: 101-1631-12-0



Note: *For Hale FS Series Strainers, use when Strainer is subjected to flushing water pressure.*



MST Wiring Harness Extension 72" (1.9m)
p/n: 513-0320-17-0



FS-15 Strainer
p/n: 510-0150-00-0

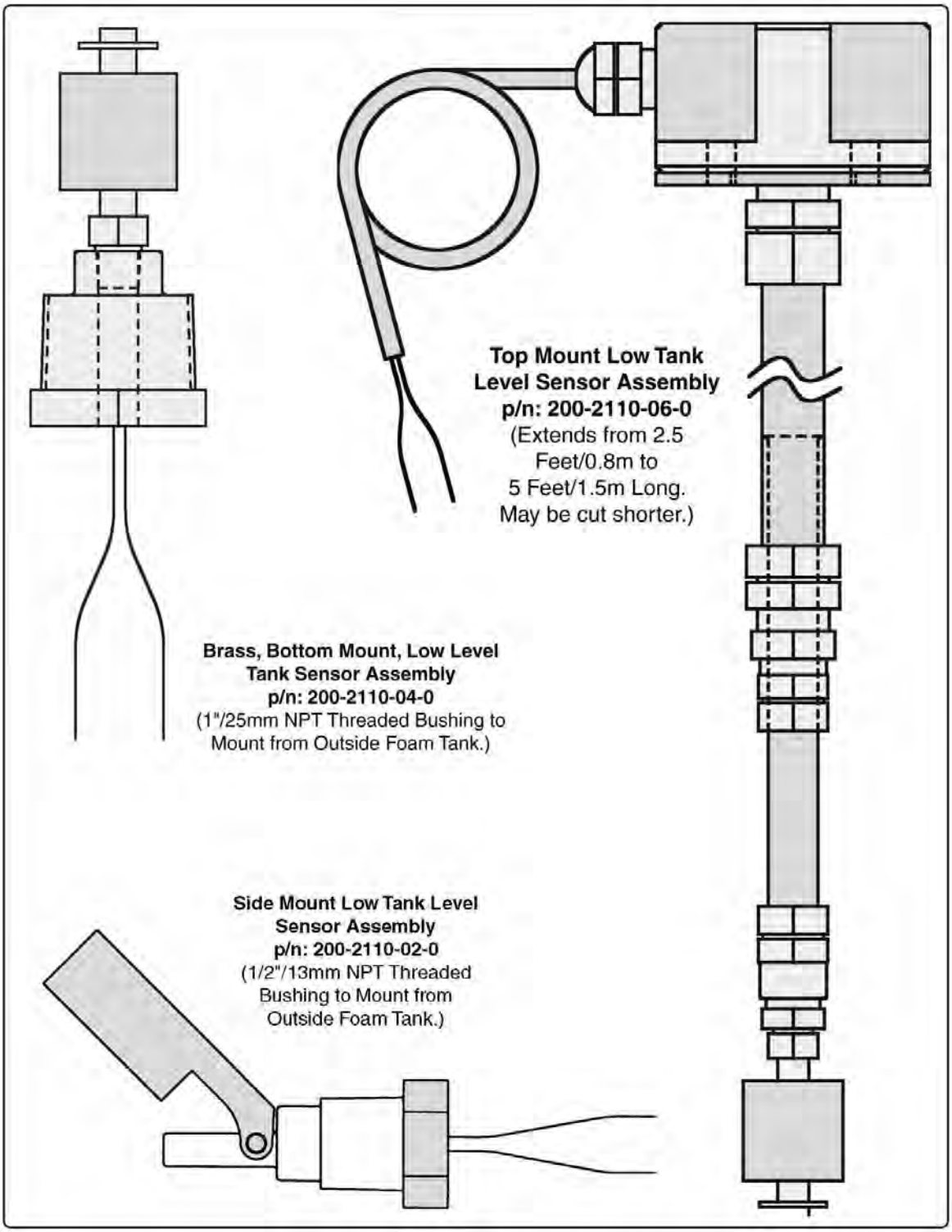
(3/4" / 19mm NPT Threads. Use with Class "A" and thin Class "B" Foam Concentrates)

FS-25 Strainer
p/n: 510-0180-00-0

(1"/25.4mm Threads. Use with Class "A" and Class "B" Foam Concentrate)

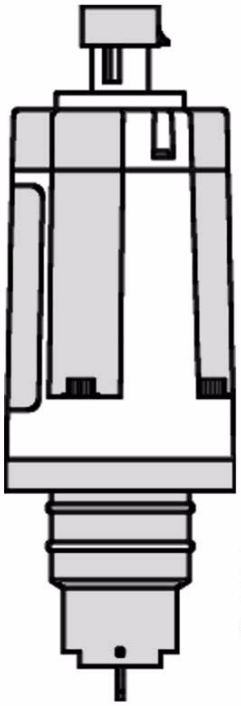


8.5 LOW TANK LEVEL SENSOR OPTIONS



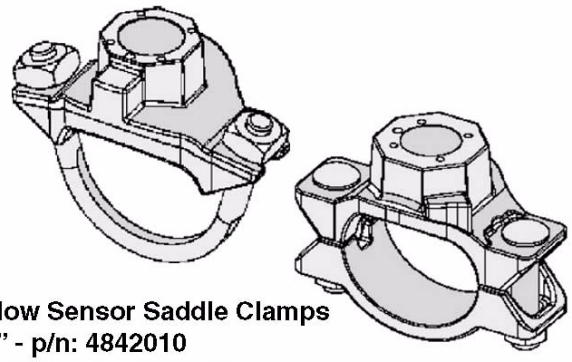
8.6 FLOW SENSORS

Each Hale foam system requires a flow sensor to operate. Pipe size must be selected based on the minimum and maximum water flow in the foam capable discharge. Following is a list of pipe size and rated flow ranges along with flow sensor saddle clamp part numbers. In all instances a weld fitting may be substituted for the saddle clamp.

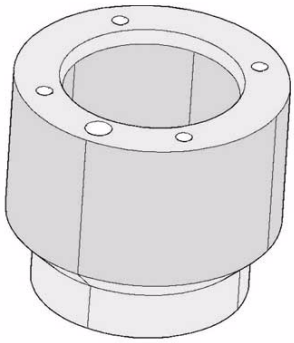


Flow Sensor
Paddle Wheel
p/n: 102714

Pipe Size	Flow Range	
	GPM	LPM
1½" (38mm)	10 - 330	38 - 1,249
2" (50mm)	20 - 550	76 - 2,082
2½" (64mm)	30 - 800	114 - 3,028
3" (76mm)	50 - 1,250	189 - 4,732
4" (102mm)	75 - 1,800	284 - 6,814
SCV or DCV	30 - 750	114 - 2,839



Flow Sensor Saddle Clamps
2" - p/n: 4842010
2-1/2" - p/n: 4843010
3" - p/n: 4844010
4" - p/n: 4846010



Flow Sensor Weld Fitting
Aluminum - p/n: 309010
Stainless Steel - p/n: 082-3060-00-0
Steel - p/n: 309020

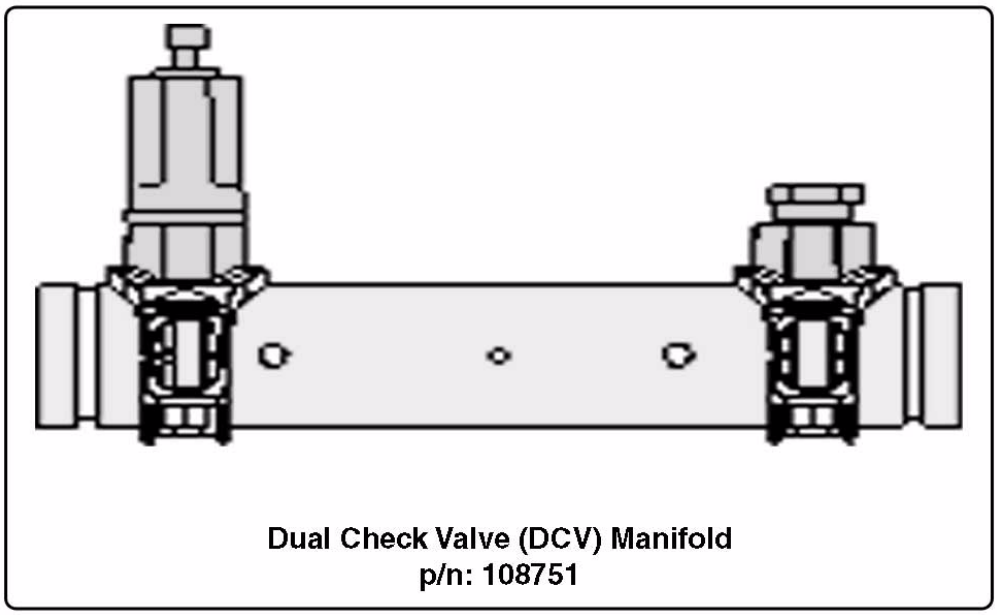
8.7 MAIN CABLE HARNESS, SINGLE AND DUAL TANK

Item	Part No.	Qty.	Description
.....	113436	1	Control Head Harness, 10’ x 4’ (3.1 x 1.2 m) 10’ - Flow Sensor x 4’ - Motor Control
.....	113438	1	Control Head Harness, 10’ x 14’ (3.1 x 4.3 m) 10’ - Flow Sensor x 14’ - Motor Control
.....	113439	1	Control Head Harness, 15’ x 19’ (4.6 x 5.8 m) 15’ - Flow Sensor x 19’ - Motor Control
.....	113437	1	Control Head Harness, 32” x 5.5’ (0.81 x 1.7 m) 32” - Flow Sensor x 5.5’ - Motor Control
.....	113434	1	Single Tank Moto Control
.....	113435	1	Dual Tank Motor Control
.....	113437	1	Control Head Harness, 32” x 5.5’ (0.81 x 1.7 m) 32” - Flow Sensor x 5.5’ - Motor Control
.....	113437	1	Control Head Harness, 32” x 5.5’ (0.81 x 1.7 m) 32” - Flow Sensor x 5.5’ - Motor Control

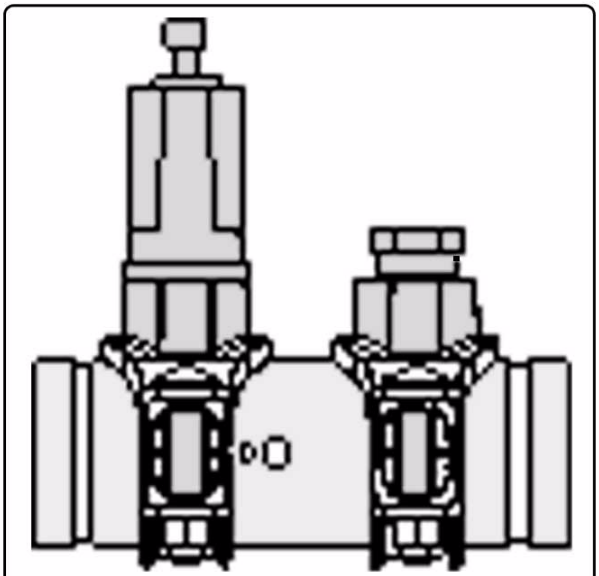
- ***For cable harness overviews, see Section “ 9 Plate Drawings,” beginning on page 170.***

8.8 CHECK VALVE MANIFOLDS

The check valve manifolds include flow sensors, check valve/injector fittings and single or dual waterway check valve flappers. End connections for the manifolds are 3” (76mm) Vitaulic.

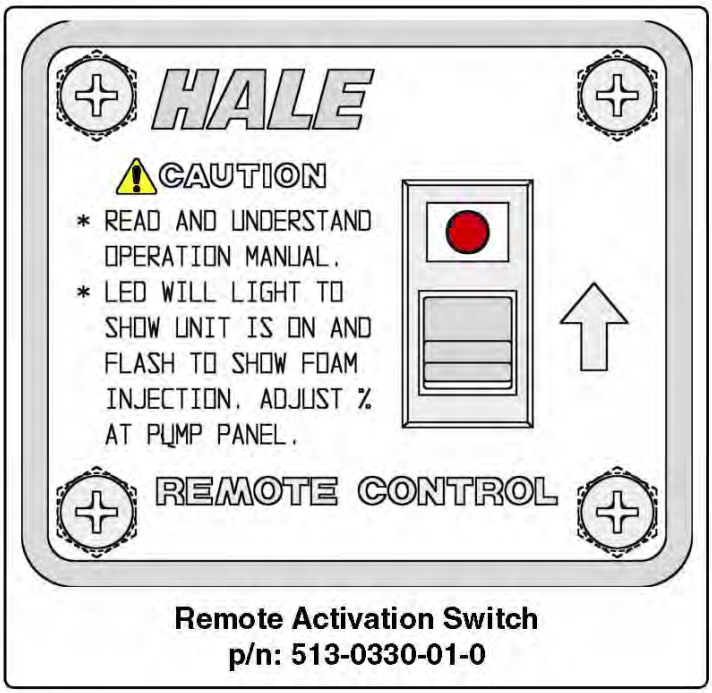


Dual Check Valve (DCV) Manifold
p/n: 108751

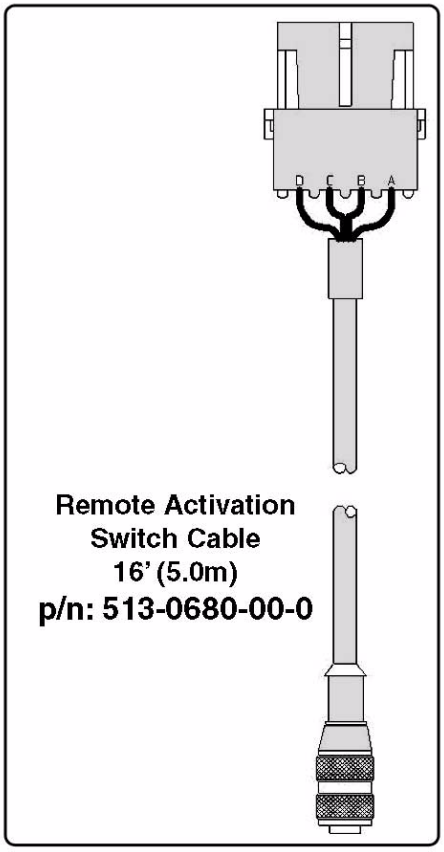


Single Check Valve (SCV) Manifold
p/n: 108893

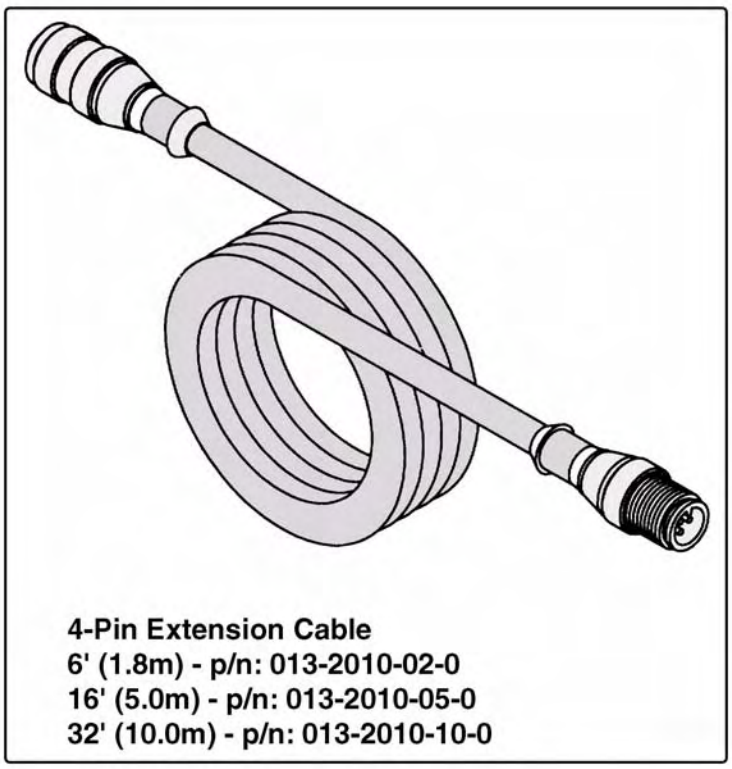
8.9 REMOTE ACTIVATION SWITCH OPTION



Remote Activation Switch
p/n: 513-0330-01-0

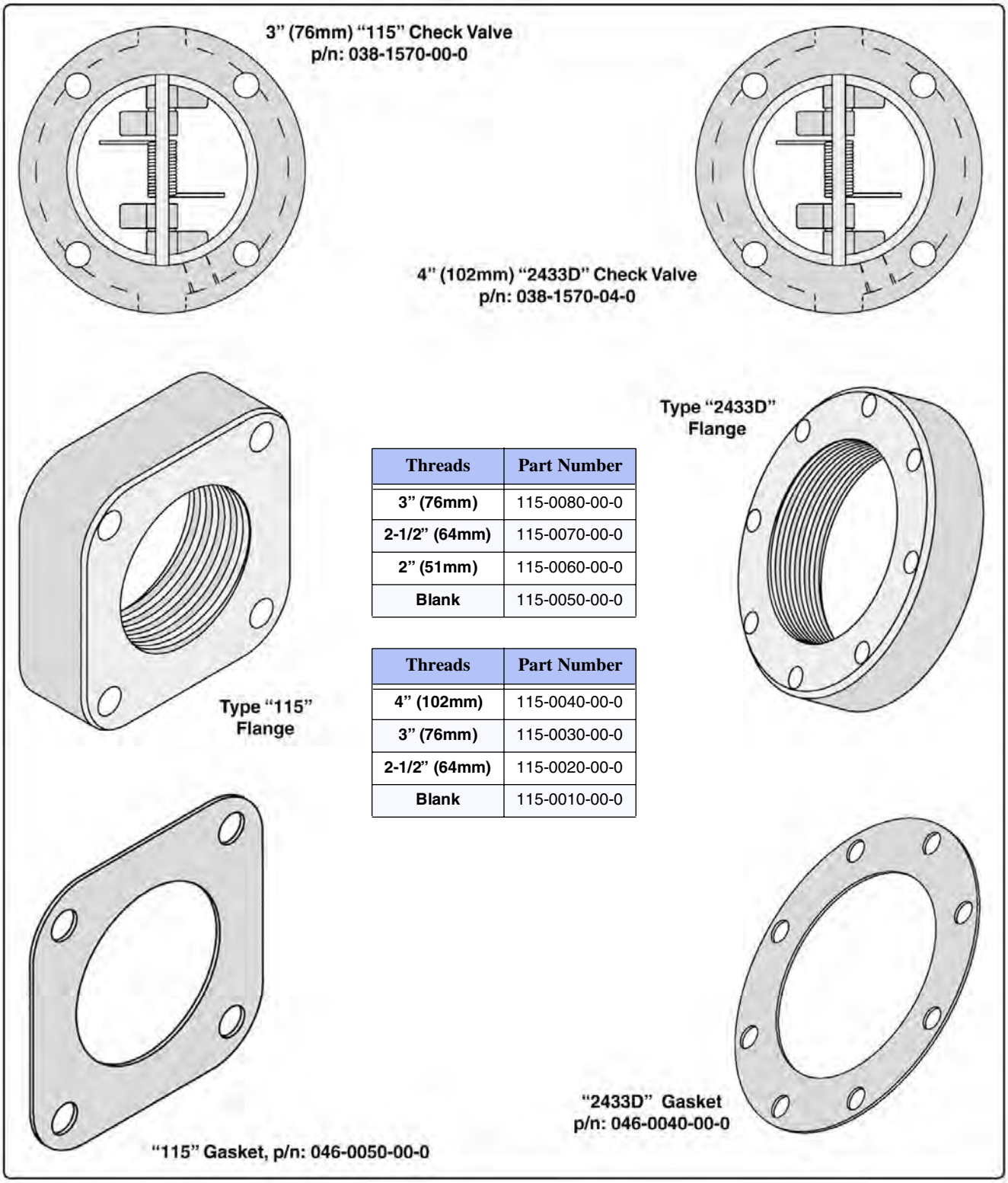


Remote Activation Switch Cable
16' (5.0m)
p/n: 513-0680-00-0



4-Pin Extension Cable
6' (1.8m) - p/n: 013-2010-02-0
16' (5.0m) - p/n: 013-2010-05-0
32' (10.0m) - p/n: 013-2010-10-0

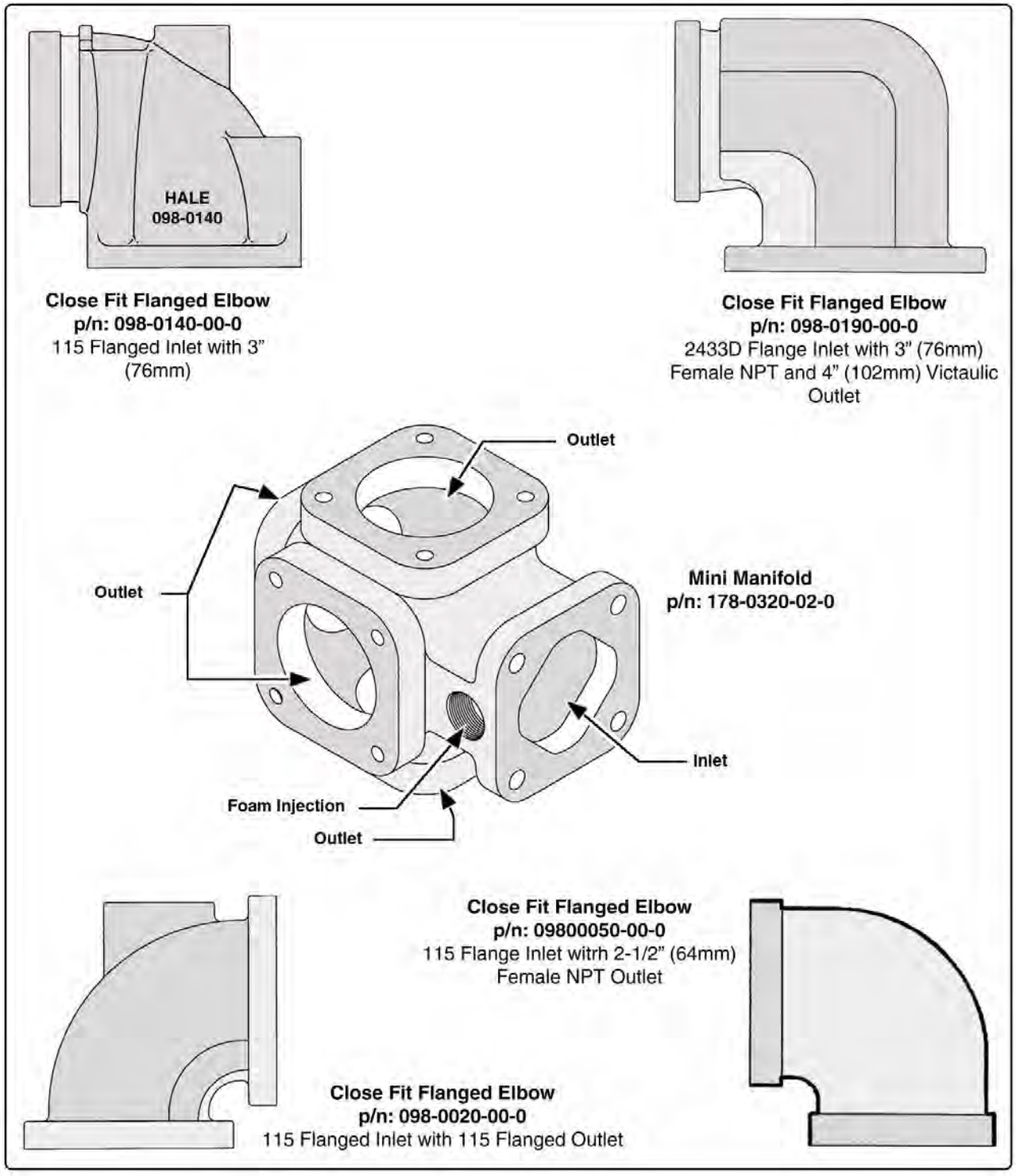
8.10 CHECK VALVES, FLANGES, GASKETS



Threads	Part Number
3" (76mm)	115-0080-00-0
2-1/2" (64mm)	115-0070-00-0
2" (51mm)	115-0060-00-0
Blank	115-0050-00-0

Threads	Part Number
4" (102mm)	115-0040-00-0
3" (76mm)	115-0030-00-0
2-1/2" (64mm)	115-0020-00-0
Blank	115-0010-00-0

8.11 ELBOWS AND MINI MANIFOLDS



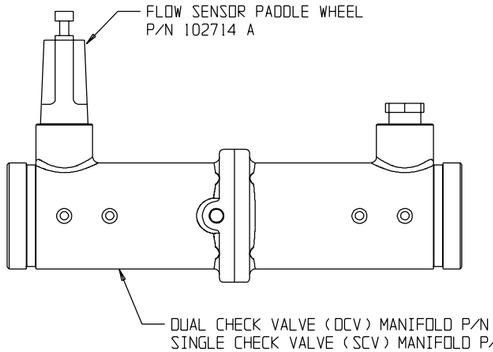
9 Plate Drawings

Description	Plate Number
FoamLogix System Packaging	850B
Pump Motor Sub-Assembly	844B
Foam Pump Sub-Assembly	849A
FoamLogix with NO Tank Selector Option	848B
FoamLogix with “MST” Selector Option	847B
FoamLogix with MDT II Selector Option	846B
FoamLogix with ADT Option	845B
Foam System Power Filter Kit Option	891A

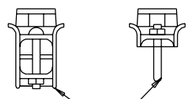
Cable Harness

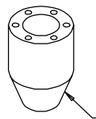
Harness, Distribution Box, Single Tank Motor Control	113434
Harness, Distribution Box, Dual Tank Motor Control	113435
Harness, FoanLogix Control Head	113436 113437 113438 113439

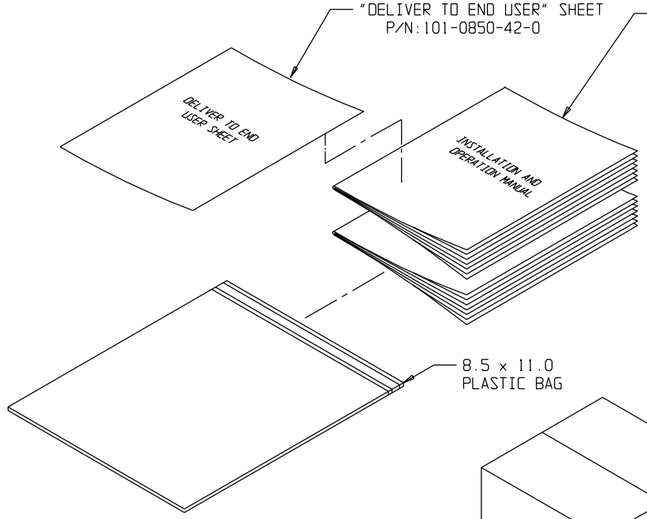
FLOW SENSOR OPTIONS

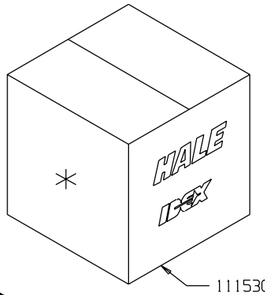


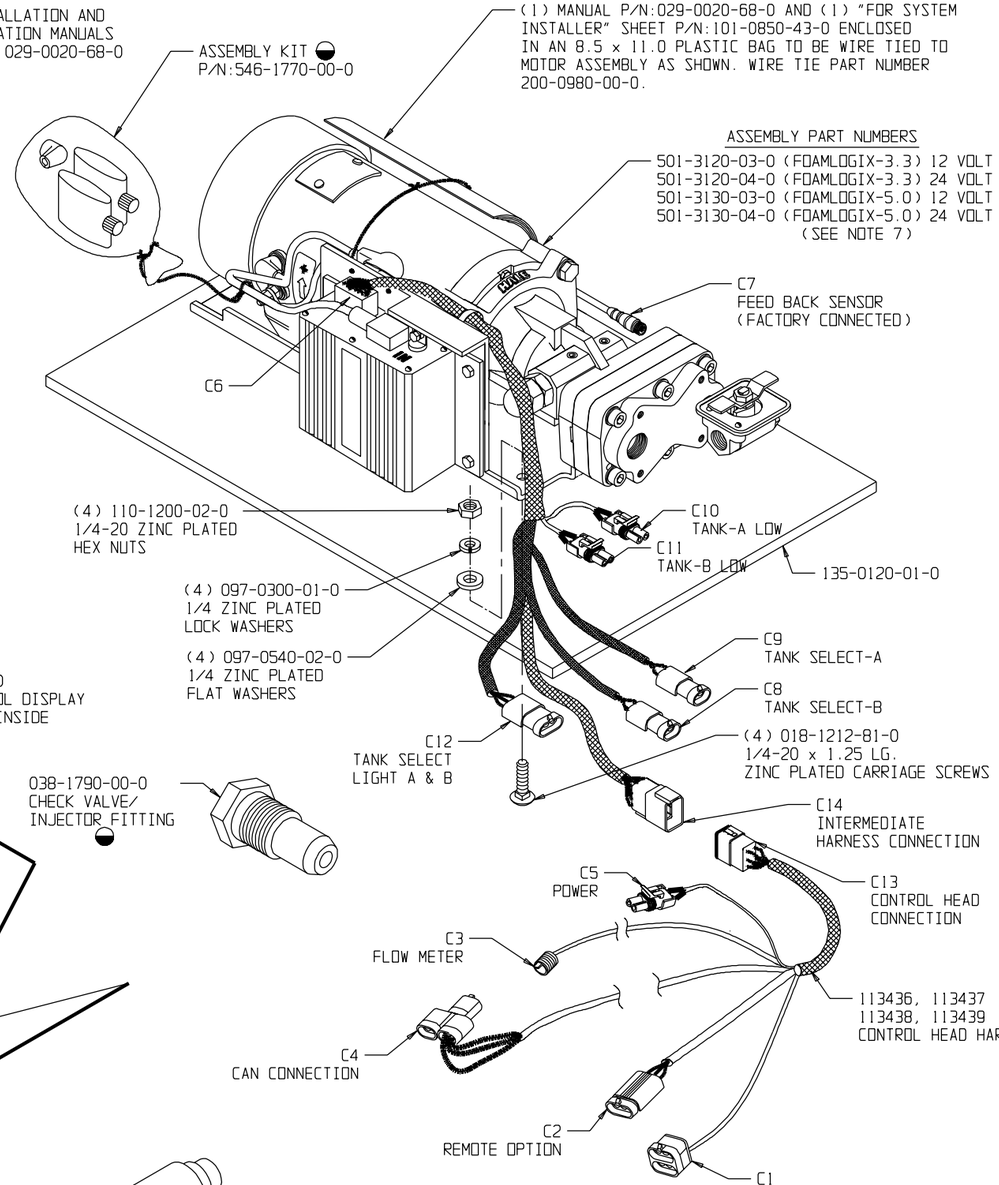
CHECK VALVE MANIFOLDS INCLUDE FLOW SENSOR, CHECK VALVE/INJECTOR FITTING & SINGLE OR DUAL WATER WAY CHECK VALVE FLAPPERS. END CONNECTION FOR THE MANIFOLDS ARE 3.00" (76.2) VICTAULIC.

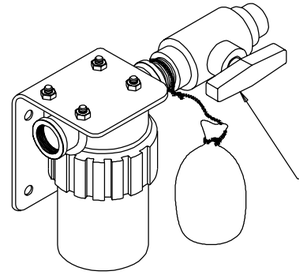


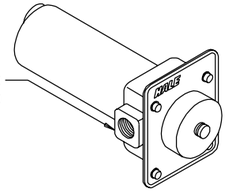


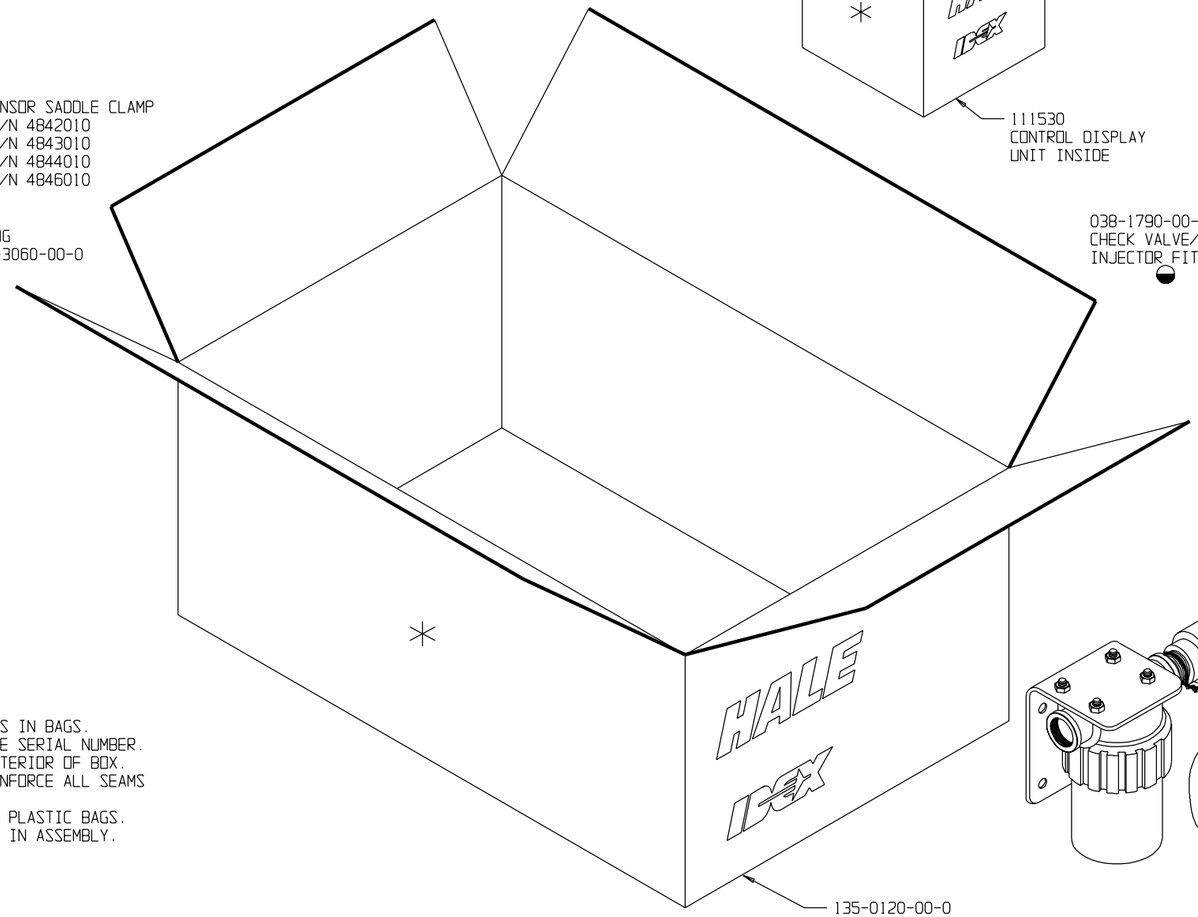












NOTES:

1) FOAM PACK ALL COMPONENTS IN BOX.
2) PACK ALL CABLES AND SMALL COMPONENTS IN BAGS.
3) ALL PARTS MARKED BY * TO BE THE SAME SERIAL NUMBER.
4) CHECK OPTIONAL ITEMS SUPPLIED ON EXTERIOR OF BOX.
5) SEAL BOX WITH STAPLES AND TAPE, REINFORCE ALL SEAMS WITH TAPE.
6) ALL OTHER OPTIONS TO BE PACKAGED IN PLASTIC BAGS.
7) ALL PARTS MARKED BY ◒ ARE INCLUDED IN ASSEMBLY.

FOAMLOGIX SYSTEM PACKAGING

PLATE NO. 850BB

ECO NO	REV	CHANGED FROM	BY	DATE	APVD
04-214	A	FOAM MASTER TO FOAMLOGIX	TKC	9-10-04	MAL
0387	B	REDESIGN WIRING CONFIGURATION	KSM	07-13-06	MAL
-	-	-	-	-	-
-	-	-	-	-	-

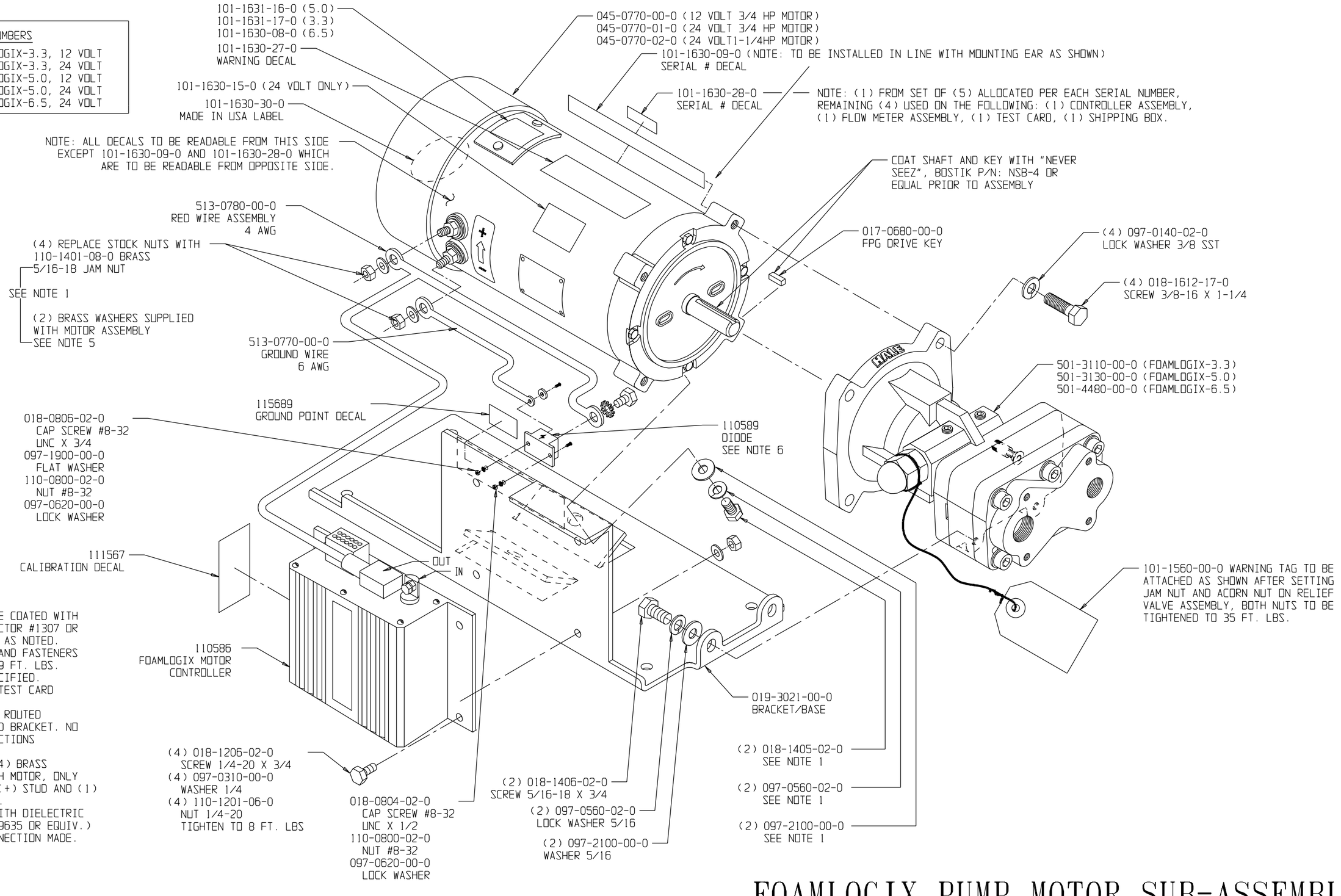
HALE PRODUCTS, INC.
A Unit of IDEX Corporation
Conshohocken, PA 19428 USA

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DRAWN FAS | CHECKED MAL | DATE 9-16-96 | SIZE D | SCALE: FULL

Notes

ASSEMBLY PART NUMBERS	
501-3120-03-0	FOAMLOGIX-3.3, 12 VOLT
501-3120-04-0	FOAMLOGIX-3.3, 24 VOLT
501-3130-03-0	FOAMLOGIX-5.0, 12 VOLT
501-3130-04-0	FOAMLOGIX-5.0, 24 VOLT
501-4480-04-0	FOAMLOGIX-6.5, 24 VOLT



NOTES:

1) ALL CONNECTIONS TO BE COATED WITH KRYLON BATTERY PROTECTOR #1307 OR EQUAL AFTER ASSEMBLY AS NOTED.
2) ALL ASSEMBLY SCREWS AND FASTENERS TO BE TIGHTENED TO 19 FT. LBS. UNLESS OTHERWISE SPECIFIED.
3) TEST PER #TP-18 AND TEST CARD #TC-52.
4) CABLE ASSEMBLY TO BE ROUTED BETWEEN PUMP HEAD AND BRACKET. NO SHARP BENDS AT CONNECTIONS PERMITTED.
5) DISCARD (2) OUT OF (4) BRASS WASHERS SUPPLIED WITH MOTOR, ONLY USE (1) ON POSITIVE (+) STUD AND (1) ON NEGATIVE (-) STUD.
6) DIODE TO BE COATED WITH DIELECTRIC GREASE (DYNTEX P/N 49635 OR EQUIV.) WHERE ELECTRICAL CONNECTION MADE.

FOAMLOGIX PUMP MOTOR SUB-ASSEMBLY

ECO NO	REV	CHANGED FROM	BY	DATE	APVD
04-214	A	FOAM MASTER TO FOAMLOGIX	TKC	9-10-04	MAL
0387	B	REDESIGN WIRING CONFIGURATION	KSM	6-30-06	MAL
0491	C	UPDATED TO CURRENT PRODUCTION	MJP	11-30-06	MAL
0507	D	UPDATED TO CURRENT PRODUCTION	MJP	1-12-07	MAL

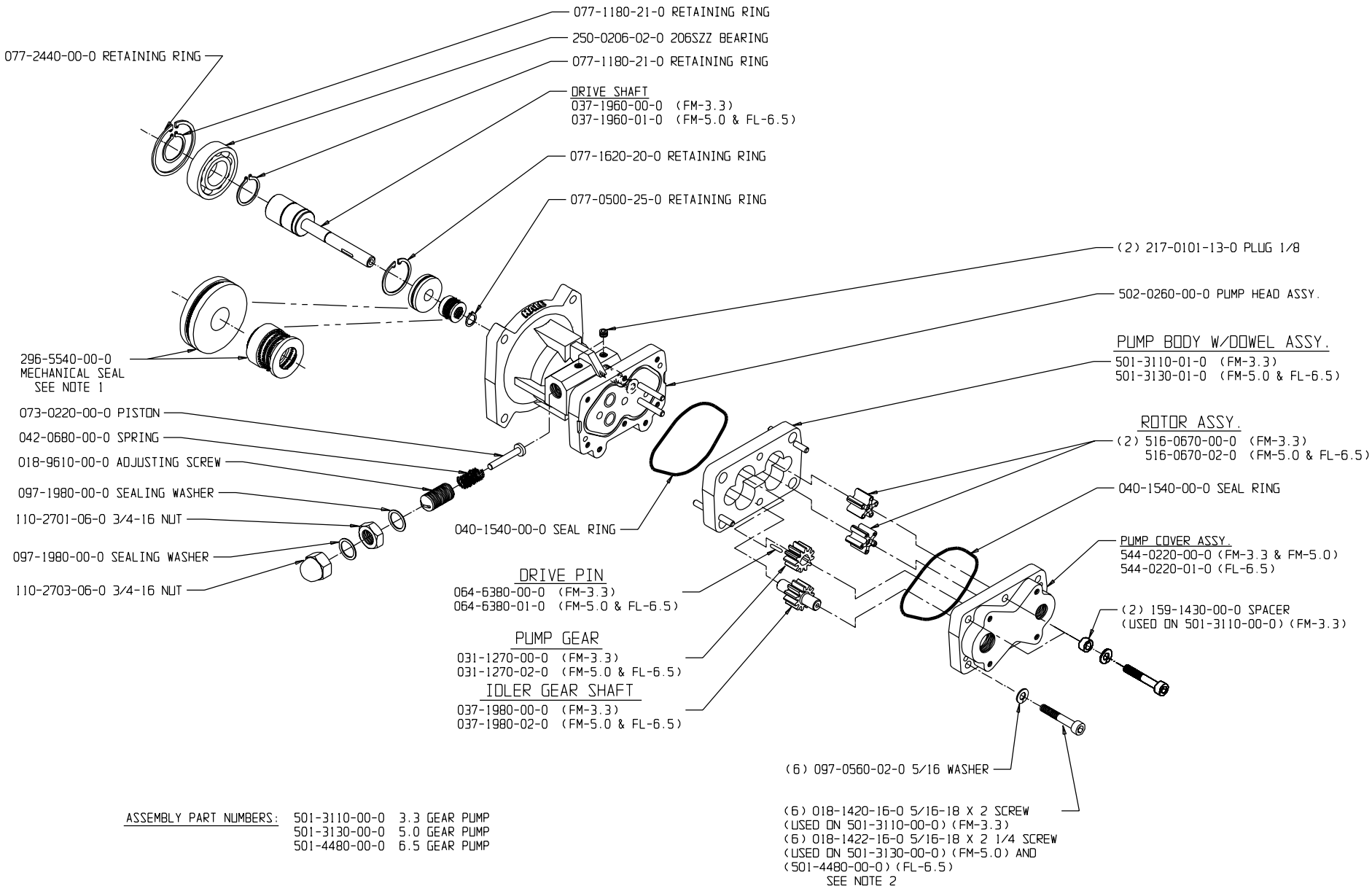
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A Unit of IDEX Corporation
Conshohocken, PA 19428 USA

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DRAWN FAS | CHECKED MAL | DATE 9-16-96 | SIZE D | SCALE: FULL

PLATE NO. 844BC

Notes



ASSEMBLY PART NUMBERS:
501-3110-00-0 3.3 GEAR PUMP
501-3130-00-0 5.0 GEAR PUMP
501-4480-00-0 6.5 GEAR PUMP

NOTES:

1) CARBON ROTATING FACE MUST BE FREE FROM IMPERFECTIONS AND FACE TOWARDS STATIONARY SEATS.
2) TORQUE ALL FASTENERS NOTED TO 19 FT. LBS.
3) LIGHTLY LUBRICATE O-RINGS WITH MULTI-PURPOSE GREASE OR EQUAL BEFORE INSTALLATION.

FOAM MASTER FOAM PUMP SUB-ASSEMBLY

PLATE NO. 849AF

ECO NO	REV	CHANGED FROM	BY	DATE	APVD
0465	E	UPDATED SENSOR	MJP	10-27-06	MAL
0497	F	UPDATED TO CURRENT PRODUCTION	MJP	12-13-06	MAL

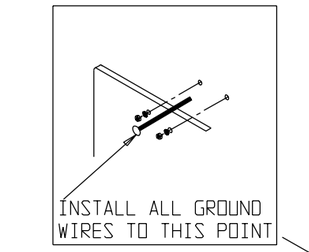
ECO NO	REV	CHANGED FROM	BY	DATE	APVD
96-171	A	RELEASE TO PRODUCTION	FAS	10-1-96	MAL
97-009	B	UPDATED ASSEMBLY PROCEDURE AND SPECIFICATIONS	FAS	1-14-97	MAL
97-157	C	016-1010-00-0 (FM-3.0 AND FM-3.3) 016-1010-02-0 (FM-5.0)	FAS	7-25-97	MAL
01-177	D	ADDED DESCRIPTIONS & REMOVED FM3.0	TKC	4-9-01	MAL

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DRAWN FAS | CHECKED MAL | DATE 9-16-96 | SIZE D | SCALE: FULL

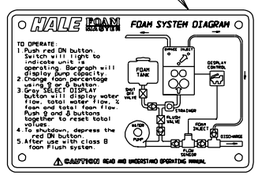
Notes



DETAIL

501-3120-03-0 FOAMLOGIX 3.3 W/12V 3/4 HP ASSY
501-3120-04-0 FOAMLOGIX 3.3 W/24V 3/4 HP ASSY
501-3130-03-0 FOAMLOGIX 5.0 W/12V 3/4 HP ASSY
501-3130-04-0 FOAMLOGIX 5.0 W/24V 3/4 HP ASSY
501-4480-04-0 FOAMLOGIX 6.5 W/24V1-1/4HP ASSY

101-1631-12-0
DIAGRAM NAME PLATE
(OPTIONAL)



△5 △6 242-1080-00-0
1.00 CLAMP

△7 C7
FEED BACK
SENSOR
(FACTORY
CONNECTED)

2 X 018-0803-16-0
SCREW-# 8-32 X 3/8 SOC HD

2 X 097-0602-00-0
LOCK WASHER

019-4100-00-0
SENSOR PROTECTOR

110-1703-06-0*
NUT 3/8-24 UNF
ACORN SST

012-1440-00-0*
HANDLE 1/2" TEE
BYPASS VALVE

(2) 012-1450-00-0 GRIP - RED*

(2) 018-1002-44-0 SCREW #10-24 X 1/4 LG.*

101-1630-01-0 BYPASS PLACARD*

C6
HARNESS
CONNECTOR

C10
TANK-A LOW

*038-1810-00-0 VALVE - BYPASS
SEE INTALLATION DETAIL FOR
VALVE POSTION

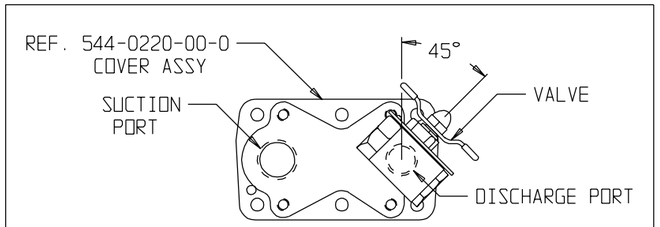
113434
SINGLE TANK
HARNESS

C9
TANK-A SELECT

082-0408-02-0 *
1/2 NPT BRS. CLS. NIPPLE

C14
INTERMEDIATE
HARNESS CONNECTION

513-0320-23-0
JUMPER CONNECTOR



INSTALLATION DETAIL FOR VALVE POSITION

NOTES:

1) FOAMLOGIX OPTION GROUP PART NUMBER: 538-1490-05-0
(INCLUDES ALL PARTS MARKED WITH *)
2) TEST UNIT WITH ALL OPTIONAL CABLES INSTALLED PER TP-18 AND FILL OUT TEST CARD TC-52
3) USE LOCTITE, PST OR EQUAL THREAD SEALING COMPOUND ON PIPE THREADS. NO TEFLON TAPE PERMITTED.
4) SYSTEM REQUIRES (1) STRAINER AND (1) LOW TANK SWITCH PER SALES ORDER.
△5) INSTALL SINGLE TANK HARNESS P/N 113434 ASSY AND CLAMP IN PLACE USING ONE INCH CLAMP P/N 242-1090-00-0 AND HARDWARE AS SHOWN.
△6) HARNESS ASSY. BETWEEN PUMP AND BRACKET IS NOT TO HAVE ANY SHARP BENDS AT CONNECTIONS.
△7) CONNECT C7 CONNECTOR TO FEED BACK SENSOR.
8) HARNESS CONNECTORS C6, C7, C8, AND C9 ARE CONNECTED AT FACTORY.

FOAMLOGIX WITH NO TANK SELECTOR OPTION

PLATE NO. 848BC

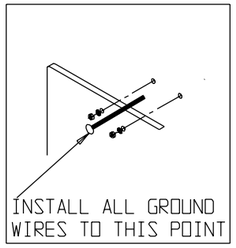
ECO NO	REV	CHANGED FROM	BY	DATE	APVD
04-214	A	FOAM MASTER TO FOAMLOGIX	TKC	9-10-04	MAL
0387	B	REDESIGN WIRING CONFIGURATION	KSM	06-30-06	MAL
0491	C	UPDATED TO CURRENT PRODUCTION	MJP	12-04-06	MAL
0507	D	UPDATED TO CURRENT PRODUCTION	MJP	1-12-07	MAL

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DRAWN FAS | CHECKED MAL | DATE 9-16-96 | SIZE D | SCALE: FULL

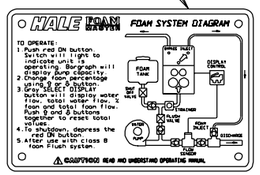
Notes

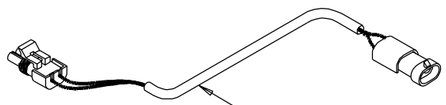


DETAIL

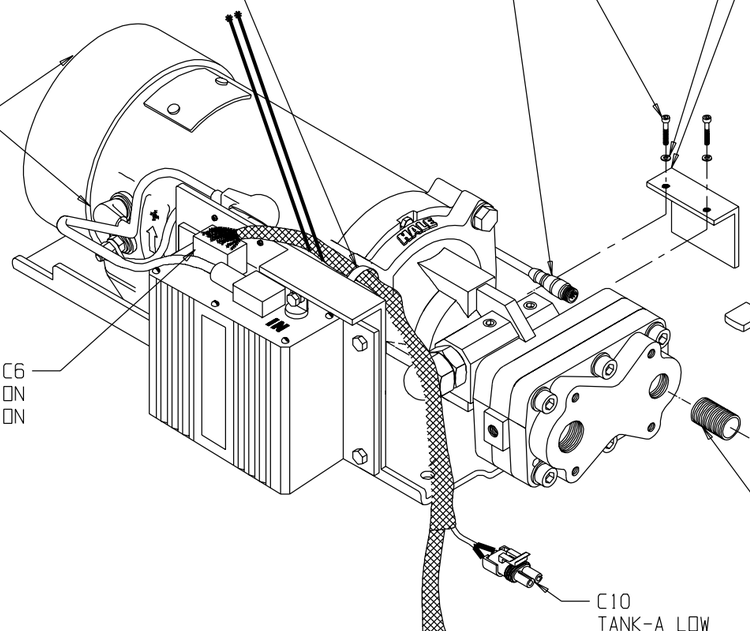
501-3120-03-0	FOAMLOGIX 3.3	W/12V - 3/4 HP ASSY.
501-3120-04-0	FOAMLOGIX 3.3	W/24V - 3/4 HP ASSY.
501-3130-03-0	FOAMLOGIX 5.0	W/12V - 3/4 HP ASSY.
501-3130-04-0	FOAMLOGIX 5.0	W/24V - 3/4 HP ASSY.
501-4480-04-0	FOAMLOGIX 6.5	W/24V -1-1/4HP ASSY.

101-1631-12-0
FOAM SYSTEM
DIAGRAM NAMEPLATE
(OPTIONAL)





513-0320-07-0
MST- WIRING EXTENSION
HARNESS (6FT)



△5 △6 242-1080-00-0
1.00 CLAMP

△7 C7
FEED BACK SENSOR
(FACTORY CONNECTED)

2 X 018-0803-16-0
SCREW-# 8-32 X 3/8 SOC HD

2 X 097-0602-00-0
LOCK WASHER

019-4100-00-0
SENSOR PROTECTOR

110-1730-06-0 *
NUT 3/8 UNF
ACRON SST

012-1440-00-0 *
HANDLE 1/2" TEE
BYPASS VALVE

(2) 012-1450-00-0 GRIP - RED *

(2) 018-1002-44-0 SCREW #10-24 X 1/4 LG. *

101-1630-01-0 BYPASS PLACARD *

C6
DISTRIBUTION
BOX CONNECTION

038-1810-00-0 VALVE - BYPASS *
SEE INTALLATION DETAIL FOR
VALVE POSTION

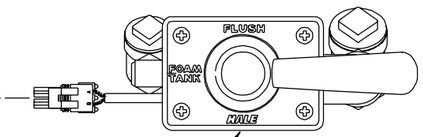
C10
TANK-A LOW

113434
SINGLE TANK
HARNESS

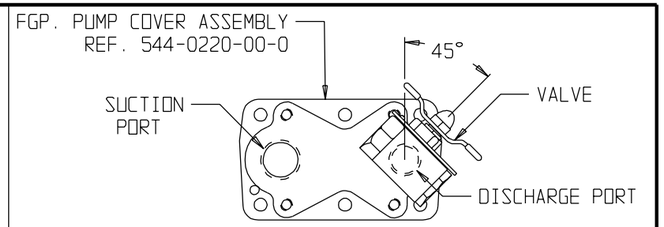
082-0408-02-0 *
1/2 NPT BRS. CLS. NIPPLE

C14
INTERMEDIATE
HARNESS CONNECTION

C8
TANK SELECT-B



*538-1490-02-0
MST- SINGLE TANK VALVE



INSTALLATION DETAIL FOR VALVE POSITION

NOTES:

1) FOAMLOGIX OPTION GROUP PART NUMBER: 538-1490-12-0 (INCLUDES ALL PARTS MARKED WITH *)
2) TEST UNIT WITH ALL OPTIONAL CABLES INSTALLED PER TP-18 AND FILL OUT TEST CARD TC-52.
3) USE LOCTITE, PST OR EQUAL THREAD SEALING COMPOUND ON PIPE THREADS. NO TEFLON TAPE PERMITTED.
4) SYSTEM REQUIRES (1) STRAINER AND (1) LOW TANK SWITCH PER SALES ORDER.
△5) INSTALL SINGLE TANK HARNESS P/N 113434 ASSY AND CLAMP IN PLACE USING ONE INCH CLAMP P/N 242-1080-00-0 AND HARDWARE AS SHOWN.
△6) HARNESS ASSY. BETWEEN PUMP AND BRACKET IS NOT TO HAVE ANY SHARP BENDS AT CONNECTIONS.
△7) CONNECT C7 CONNECTOR TO FEED BACK SENSOR.
8) HARNESS CONNECTORS C6 AND C7 ARE CONNECTED AT FACTORY.

FOAMLOGIX WITH MST SELECTOR OPTION

PLATE NO. 847BC

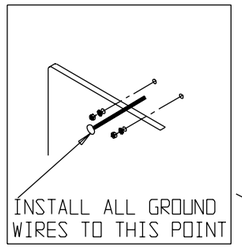
ECO NO	REV	CHANGED FROM	BY	DATE	APVD
04-214	A	FOAM MASTER TO FOAMLOGIX	TKC	9-10-04	MAL
0387	B	REDESIGN WIRING CONFIGURATION	KSM	06-30-06	MAL
0491	C	UPDATED TO CURRENT PRODUCTION	MJP	12-04-06	MAL
0507	D	UPDATED TO CURRENT PRODUCTION	MJP	1-12-07	MAL

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DRAWN FAS | CHECKED MAL | DATE 9-16-96 | SIZE D | SCALE: FULL

Notes



DETAIL

501-3120-03-0 FOAMLOGIX 3.3 W/12 V, 3/4 HP MOTOR
501-3120-04-0 FOAMLOGIX 3.3 W/24 V, 3/4 HP MOTOR
501-3130-03-0 FOAMLOGIX 5.0 W/12 V, 3/4 HP MOTOR
501-3130-04-0 FOAMLOGIX 5.0 W/12 V, 3/4 HP MOTOR
501-4480-04-0 FOAMLOGIX 6.5 W/24 V,1-1/4HP MOTOR

C6
DISTRIBUTION
BOX CONNECTION

242-1080-00-0
1.00 CLAMP

5 6

C7
FEED BACK SENSOR
(FACTORY CONNECTED)

7

2 X 018-0803-16-0
SCREW-# 8-32 X 3/8 SOC HD
2 X 097-0602-00-0
LOCK WASHER

019-4100-00-0
SENSOR PROTECTOR

110-1703-06-0*
3/8-24 UNF ACORN NUT

012-1440-00-0*
TEE HANDLE

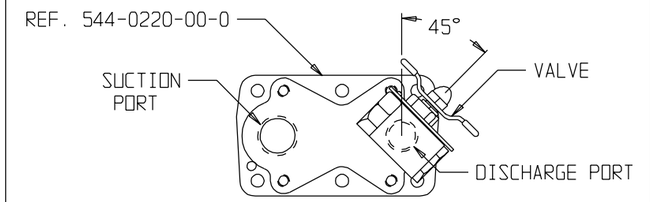
(2) 012-0450-00-0*
COVER

(2) 018-1002-44-0*
SCREW, 10-24 x 1/4 LG

101-1630-01-0*
BYPASS PLACARD

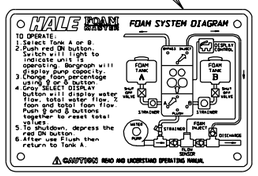
*038-1810-00-0 BYPASS VALVE
(SEE INSTALLATION DETAIL
FOR VALVE POSITION)

082-0408-02-0 *
1/2 NPT CLOSE NIPPLE
(BRASS)



INSTALLATION DETAIL FOR VALVE POSITION

101-1631-07-0 FOAM SYSTEM
DIAGRAM NAMEPLATE
(OPTIONAL)



113435
DUAL TANK HARNESS

C11
TANK B LOW

C10
TANK-A LOW

513-0320-01-0
MDT II A/B TANK HARNESS

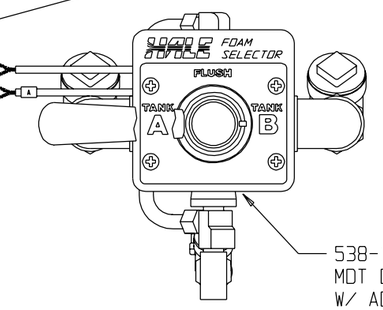
C9
TANK SELECT-A

C8
TANK SELECT-B

C14
INTERMEDIATE
HARNESS CONNECTION

513-0320-05-0
A/B INTERLOCK PLUG

C12
TANK SELECT
LIGHT A & B



538-1490-01-0 *
MDT DUAL TANK
W/ AOT SWITCHES

513-0320-02-0
MDT II WIRING
HARNESS EXTENSION
(OPTIONAL)

NOTES:

1) FOAMLOGIX OPTION GROUP PART NUMBERS: 538-1490-11-0, INCLUDES ALL PARTS MARKED WITH * UNDER THE CORRESPONDING VOLTAGE REQUIREMENT.
2) TEST UNIT WITH ALL OPTIONAL CABLES INSTALLED PER TP-18 AND FILL OUT TEST CARD TC-52.
3) USE LOCTITE PST OR EQUAL THREAD SEALING COMPOUND ON PIPE THREADS. NO TEFLON TAPE PERMITTED.
4) SYSTEM REQUIRES (2) INLET STRAINERS AND (2) LOW TANK SWITCHES PER SALES ORDER.
5) INSTALL DUAL TANK HARNESS P/N 113435 ASSY AND CLAMP IN PLACE USING (1) ONE INCH CLAMP P/N 242-1080-00-0 AND HARDWARE AS SHOWN.
6) HARNESS ASSY. BETWEEN PUMP AND BRACKET IS NOT TO HAVE ANY SHARP BENDS AT CONNECTIONS.
7) CONNECT C7 CONECTOR TO FEED BACK SENSOR.
8) HARNESS CONNECTORS C6 AND C7 ARE CONNECTED AT FACTORY.

FOAMLOGIX WITH MDT II SELECTOR OPTION

PLATE NO. 846BC

ECO NO	REV	CHANGED FROM	BY	DATE	APVD
04-214	A	FOAM MASTER TO FOAMLOGIX	TKC	9-10-04	MAL
0387	B	REDESIGN WIRING CONFIGURATION	KSM	6-30-06	MAL
0491	C	ADDED SENSOR PROTECTOR	MJP	12-01-06	MAL
0507	D	UPDATED TO CURRENT PRODUCTION	MJP	1-12-07	MAL

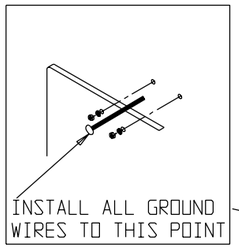
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DRAWN	FAS
CHECKED	MAL

DATE 9-16-96 | SIZE D | SCALE: FULL

Notes



DETAIL

△6 FEED BACK SENSOR
(FACTORY CONNECTED)

C7

△4 △5 242-1080-00-0
1.00 CLAMP

2 X 018-0803-16-0
SCREW-# 8-32 X 3/8 SOC HD

2 X 097-0602-00-0
LOCK WASHER

019-4100-00-0
SENSOR PROTECTOR

*538-1610-00-0 (12V)
*538-1610-01-0 (24V)
ADT SELECTOR PANEL

*040-1180-00-0
SEAL RING

*040-1230-00-0
O-RING

501-3120-03-0 FOAMLOGIX 3.3 W/12 V, 3/4 HP MOTOR
501-3120-04-0 FOAMLOGIX 3.3 W/24 V, 3/4 HP MOTOR
501-3130-03-0 FOAMLOGIX 5.0 W/12 V, 3/4 HP MOTOR
501-3130-04-0 FOAMLOGIX 5.0 W/24 V, 3/4 HP MOTOR

C6
DISTRIBUTION
BOX CONNECTION

(2) 018-1410-24-0*
12 POINT SCREW, 5/16-18 x 1 LG.

538-1640-01-0 *
ADT VALVE ASSEMBLY

C10
TANK-A LOW

C11
TANK-B LOW

△4 242-1080-00-0 1.00 CLAMP
018-1204-02-0
△5 SCREW 1/4-20 X 1/2

C9
TANK SELECT-A

C8
TANK SELECT-B

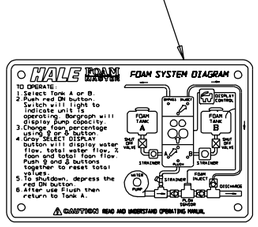
113435
DUAL TANK HARNESS

C12
TANK SELECT
LIGHT A & B

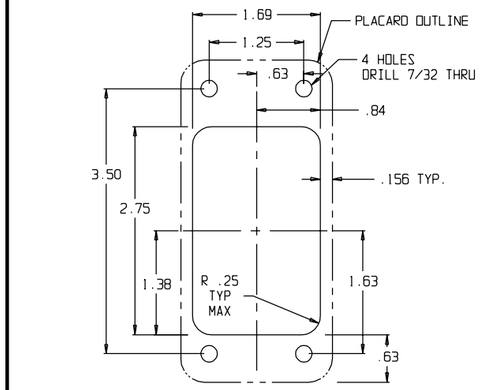
C14
INTERMEDIATE
HARNESS CONNNECTION

101-1630-24-0 *
ADT INSTALLATION DECAL

513-0300-01-0
FM WIRING HARNESS
(OPTIONAL)



*101-1631-07-0 FOAM SYSTEM
DIAGRAM NAMEPLATE



ADT SELECTOR PANEL CUTOUT DETAIL

NOTES:

1) FOAMLOGIX OPTION GROUP PART NUMBERS: 538-1640-02-0, 538-1640-03-0, AND 546-2160-00-0 INCLUDE ALL PARTS MARKED WITH * UNDER THE CORRESPONDING VOLTAGE REQUIREMENT.
2) TEST UNIT WITH ALL OPTIONAL CABLES INSTALLED PER TP-18 AND FILL OUT TEST CARD TC-52.
3) SYSTEM REQUIRES (2) INLET STRAINERS AND (2) LOW TANK SWITCHES PER SALES ORDER.
△4) INSTALL DUAL TANK HARNESS P/N 113435 ASSY AND CLAMP IN PLACE USING (2) ONE INCH CLAMPS P/N 242-1090-00-0 AND HARDWARE AS SHOWN.
△5) HARNESS ASSY. BETWEEN PUMP AND BRACKET IS NOT TO HAVE ANY SHARP BENDS AT CONNECTIONS.
△6) CONNECT C7 CONNECTOR TO FEEDBACK SENSOR

7) HARNESS CONNECTORS C6, C7, C8, AND C9 ARE CONNECTED AT FACTORY.

FOAMLOGIX WITH ADT OPTION

PLATE NO. 845BC

ECO NO	REV	CHANGED FROM	BY	DATE	APVD
04-214	A	FOAM MASTER TO FOAMLOGIX	TKC	9-10-04	MAL
0387	B	REDESIGN WIRING CONFIGURATION	KSM	06-29-06	MAL
0491	C	ADDED SENSOR PROTECTOR	MJP	12-01-06	MAL
0507	D	UPDATED TO CURRENT PRODUCTION	MJP	01-12-07	MAL

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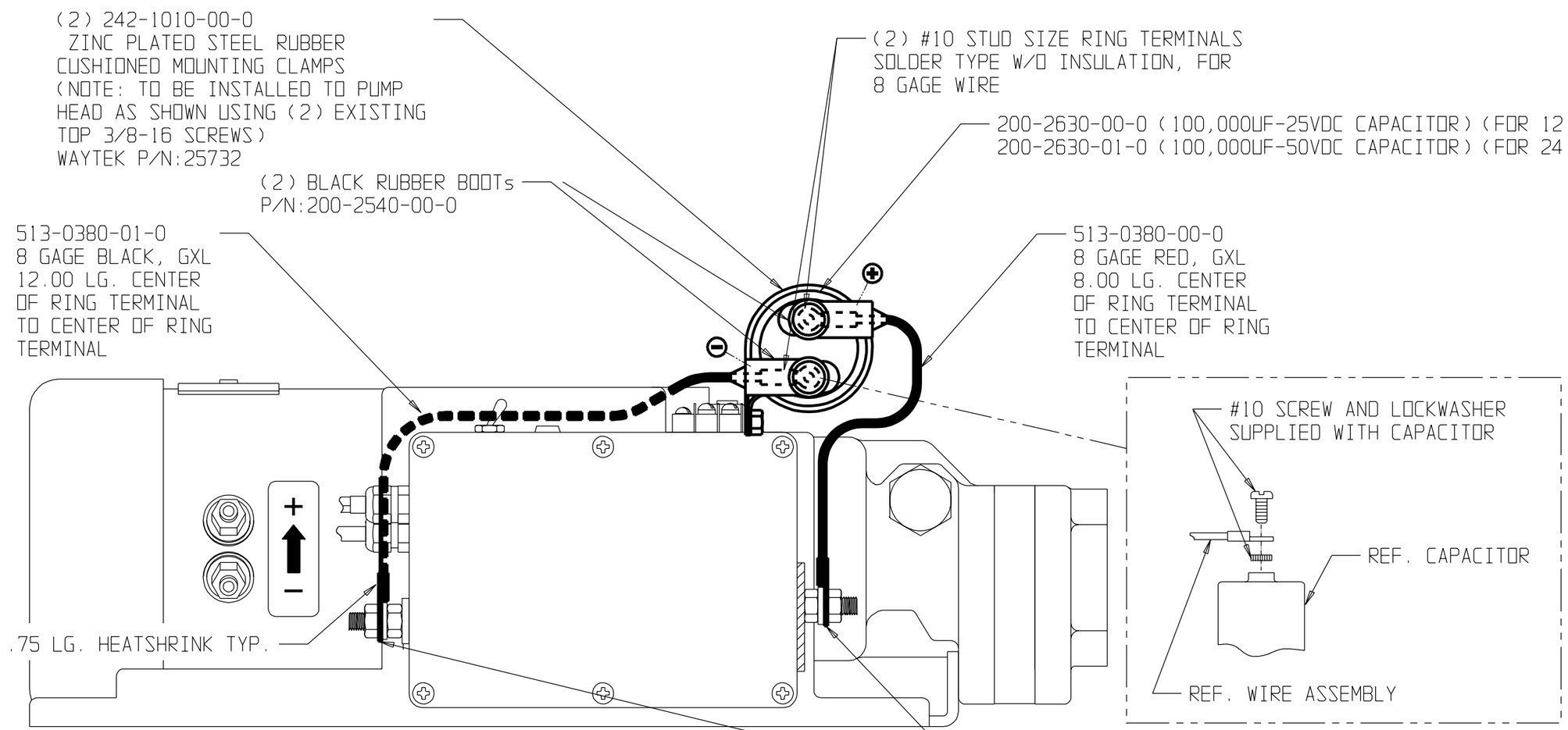
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DRAWN FAS | DATE 9-16-96 | SIZE D | SCALE: FULL
CHECKED MAL

Notes

P/N: 546-1870-00-0 (12 VDC KIT)
546-1870-01-0 (24 VDC KIT) ©

FOAM SYSTEM POWER FILTER KIT



NOTES:

1) INSTALL (2) 8 GAGE WIRES AS SHOWN. USE EXISTING 3/8 PUMP HEAD MTG. SCREWS TO SECURE CLAMPS TO PUMP ASSEMBLY.
2) DOTTED LINE ON (-) 8 GAGE WIRE REFLECTS THE WIRE RUNNING BEHIND THE MOTOR MOUNTING BRACKET.
3) USE 546-1770-00-0 TERMINAL INSULATION KIT TO PROTECT POWER AND GROUND TERMINALS ON INSTALLATION.
4) #10 SCREWS AND TERMINALS ON CAPACITOR ARE COATED WITH GC ELECTRONICS #10-9002 RED GLPT INSULATING VARNISH AFTER FACTORY INSTALLATION OF WIRE ASSEMBLIES AND TIGHTENING.

PLATE NO. 891AD

ECO NO	REV	CHANGED FROM	BY	DATE	APVD
98-54	A	RELEASE TO PRODUCTION	FAS	3-27-98	MAL
99-114	B	CHANGED KIT NAME	PRW	5-5-99	MAL
99-162	C	ADD 24VDC PART NUMBERS	PRW	6-14-99	MAL
03-309	D	CHANGE KIT NAME	PRW	10-22-03	MAL
????	E	CHANGE ASY ORDER OF WASHER & SCREW	AOB	10-09-04	MAL

HALE

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DRAWN FAS | CHECKED MAL | DATE 3-27-98 | SIZE | SCALE: FULL

Notes

Note:

1) Lengths shown are the total distance from the rear of one connector to the rear of the next.
2) For *CAN HIGH, CAN LOW,* and *CAN SHIELD* use 2 conductor Shielded J1939 cable with drain. Insulate the drain with 1/8" heatshrink at the connector ends. See Detail A.
3) Circuits in shielded cable do not need imprinting.
4) Loom should be taped 1" from pigtail connectors. All other ends should be hidden in the long heat-shrink piece at C6.
5) Use seal #12015899 on applicable Packard connectors.
6) Label all connectors.
7) Turck cable wires must be spliced to 18ga wire under the 3" long heat-shrink area. See DEATAIL B.

C14			
CONN DTM04-6P			
TERM 0460-202-20141			
TERM 0460-202-2031 (CAN ONLY)			
LOCK WM-6P			
POS	CIRCUIT	COLOR	GA
1	POWER	PINK	18
2	CAN HIGH	YELLOW	18
3	CAN SHLD	BLACK	18
4	GROUND1	BLACK	16
5	CAN LOW	GREEN	18
6	PLUG 114017	–	–

B

C7			
CONN PKG 3M-2/S90/S618			
POS	CIRCUIT	COLOR	GA
1	SENSOR SUPPLY	BROWN	–
2	IND SENSOR SIG	BLACK	–
3	SENSOR GND	BLUE	–

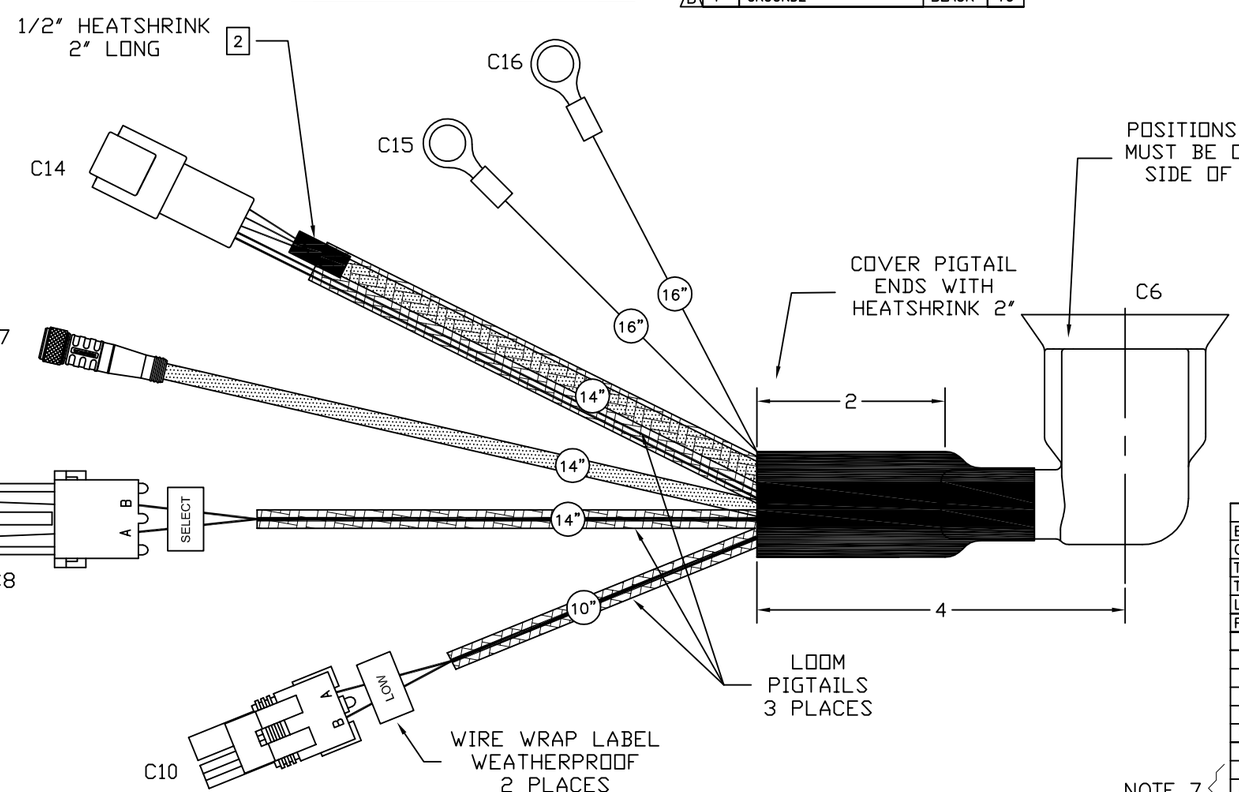
C8			
CONN 12010973			
TERM 12089040			
POS	CIRCUIT	COLOR	GA
A	POWER	PINK	18
B	TANK SELECT	BLUE	18

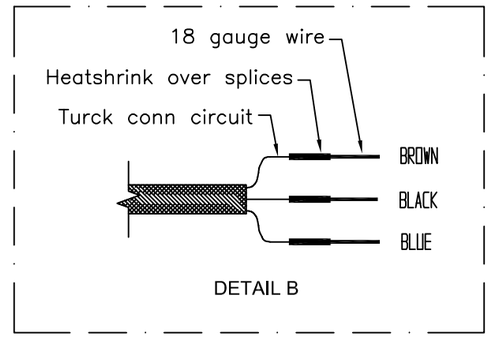
C15			
TERM PNF14-14R-3K			
POS	CIRCUIT	COLOR	GA
1	GROUND1	BLACK	16

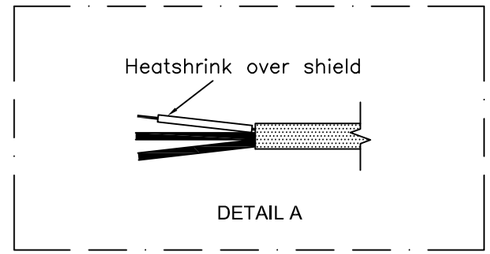
B

C16			
TERM PNF14-14R-3K			
POS	CIRCUIT	COLOR	GA
1	GROUND2	BLACK	16

B







C6			
BOOT 113858			
CONN DT06-12S			
TERM 0462-201-16141			
TERM 0462-201-1631 (CAN ONLY)			
LOCK W12S			
POS	CIRCUIT	COLOR	GA
1	POWER	PINK	18
2	CAN HIGH	YELLOW	18
3	CAN SHLD	BLACK	18
4	TANK SELECT	BLUE	18
5	PLUG 114017	–	–
6	TANK LOW	VIOLET	18
7	PLUG 114017	–	–
8	SENSOR SUPPLY	BROWN	18
9	IND SENSOR SIG	BLACK	18
10	SENSOR GND	BLUE	18
11	CAN LOW	GREEN	18
12	GROUND2	BLACK	16

NOTE 7

B

C10			
CONN 12015792			
TERM 12089188			
POS	CIRCUIT	COLOR	GA
A	POWER	PINK	18
B	TANK LOW	VIOLET	18

REV	ECR	BY	DATE	DESCRIPTION
B	2521	JCVM	10/16/06	ADDED C15 AND C16 FOR GROUND, CHANGED GAUGE OF GND
A	2470	JB	10/07/05	Added 90 degree Deutsch boot.
–	2366	JB	06/27/05	Replaced single control head / dist. box harness

DRAWING NOTES:
UNLESS OTHERWISE SPECIFIED
1. ALL dimensions are in inches
2. Do not scale drawing
3. Decimal Tolerance
X.XX = +/-.01
X.XXX = +/-.005
X.XXXX = +/-.0005
4. Angle Tolerance .5 deg.

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HARNESS DIST. BOX SINGLE TANK MOTOR CONTROL

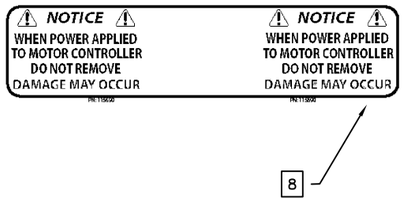
CAGE IDENT. NO.	COMPLETED	DRAWN BY	CHECKED	PROJECT
06CG4	06/27/05	JB	--	--

SIZE	DRAWING NUMBER	REV
B	113434	B
SCALE NONE		SHEET 1 OF 1

Notes

Note:

1) Lengths shown are the total distance from the rear of one connector to the rear of the next.
2) For *CAN HIGH, CAN LOW,* and *CAN SHIELD* use 2 conductor Shielded J1939 cable with drain. Insulate the drain with 1/8" heatshrink at the connector ends. See Detail A.
3) Circuits in shielded cable do not need imprinting.
4) Loom containing connectors C8 and C9 to be 8" long. Loom containing connectors C10, C11, and C12 is to be 6" long. All other ends should be hidden in the long heat-shrink piece at C6.
5) Use seal #12015899 on applicable Packard connectors.
6) Label all connectors.
7) Turck cable wires must be spliced to 18ga wire under the 3" long heat-shrink area. See DEATAIL B.
8) Place Label PN 115690 over large piece of heatshrink by folding in half.



C14			
CONN DTM04-6P			
TERM 0460-202-20141			
TERM 0460-202-2031 (CAN ONLY)			
LOCK WM-6P			
POS	CIRCUIT	COLOR	GA
1	POWER	PINK	18
2	CAN HIGH	YELLOW	18
3	CAN SHLD	BLACK	18
4	GROUND1	BLACK	16 B
5	CAN LOW	GREEN	18
6	PLUG 114017	–	–

C7			
CONN PKG 3M-2/S90/S618			
POS	CIRCUIT	COLOR	GA
1	SENSOR SUPPLY	BROWN	–
2	IND SENSOR SIG	BLACK	–
3	SENSOR GND	BLUE	–

C8			
CONN 12010973			
TERM 12089040			
POS	CIRCUIT	COLOR	GA
A	POWER	PINK	18
B	TANK A SELECT	BLUE	18

C9			
CONN 12010973			
TERM 12089040			
POS	CIRCUIT	COLOR	GA
A	POWER	PINK	18
B	TANK B SELECT	WHITE	18

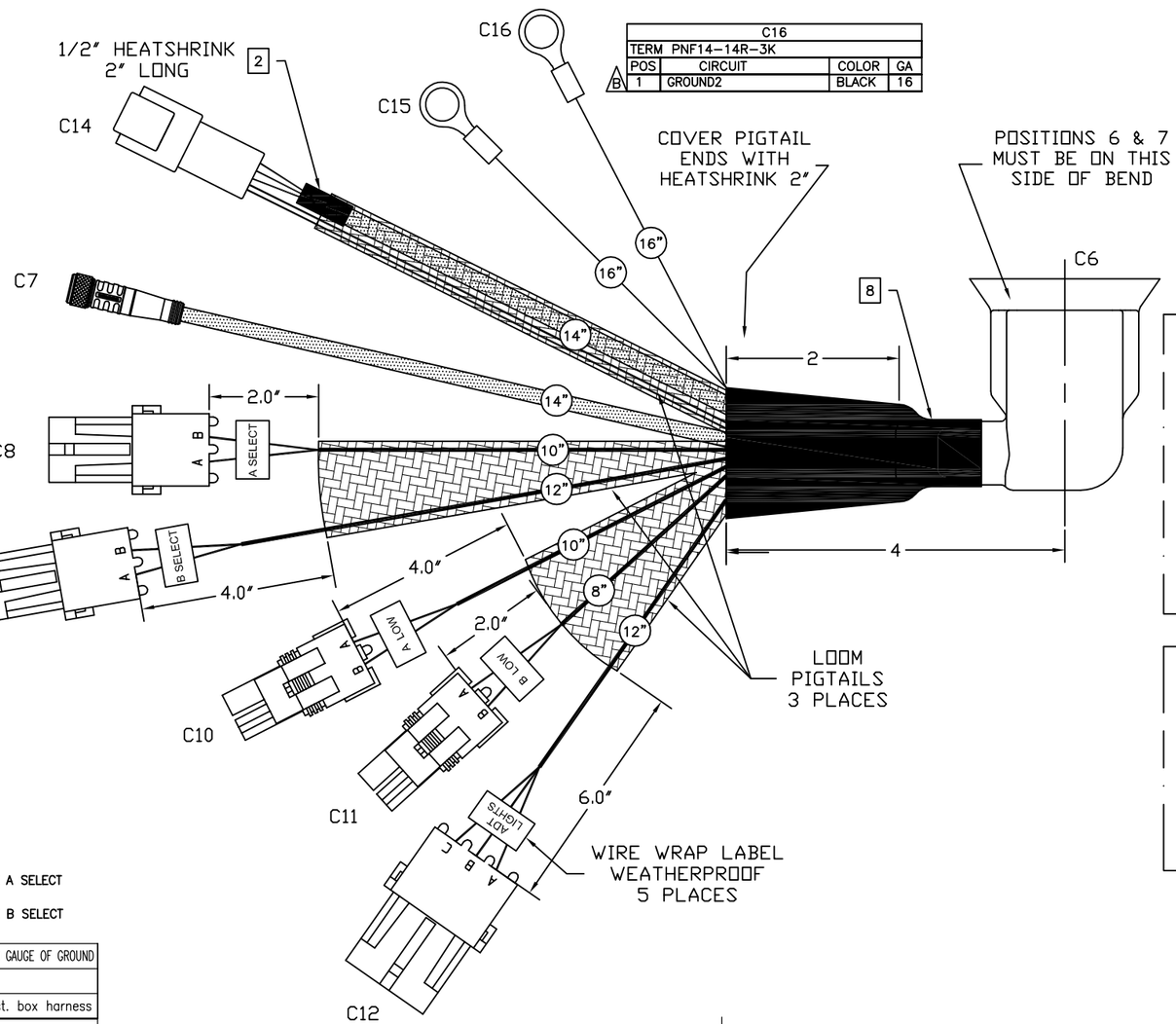
C10			
CONN 12015792			
TERM 12089188			
POS	CIRCUIT	COLOR	GA
A	POWER	PINK	18
B	TANK A LOW	VIOLET	18

C11			
CONN 12015792			
TERM 12089188			
POS	CIRCUIT	COLOR	GA
A	POWER	PINK	18
B	TANK B LOW	GRAY	18

C12			
CONN 12010717			
TERM 12089040			
POS	CIRCUIT	COLOR	GA
A	TANK A SELECT LIGHT	BLUE	18 – SPLICE TO TANK A SELECT
B	GROUND2	BLACK	16 A
C	TANK B SELECT LIGHT	WHITE	18 – SPLICE TO TANK B SELECT

C15			
TERM PNF14-14R-3K			
POS	CIRCUIT	COLOR	GA
1	GROUND1	BLACK	16 B

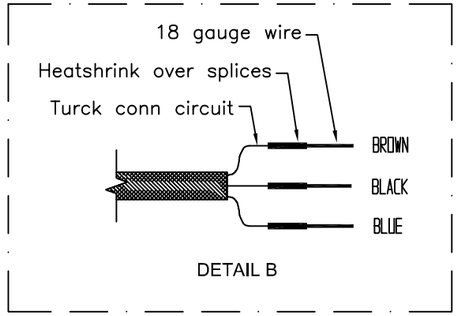
C16			
TERM PNF14-14R-3K			
POS	CIRCUIT	COLOR	GA
1	GROUND2	BLACK	16 B



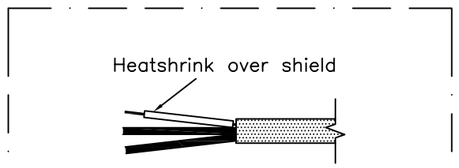
C6			
BOOT 113858			
CONN DT06-12S			
TERM 0462-201-16141			
TERM 0462-201-1631 (CAN ONLY)			
LOCK W12S			
POS	CIRCUIT	COLOR	GA
1	POWER	PINK	18
2	CAN HIGH	YELLOW	18
3	CAN SHLD	BLACK	18
4	TANK A SELECT	BLUE	18
5	TANK B SELECT	WHITE	18
6	TANK A LOW	VIOLET	18
7	TANK B LOW	GRAY	18
8	SENSOR SUPPLY	BROWN	18
9	IND SENSOR SIG	BLACK	18
10	SENSOR GND	BLUE	18
11	CAN LOW	GREEN	18
12	GROUND2	BLACK	16 B

NOTE 7

POSITIONS 6 & 7
MUST BE ON THIS
SIDE OF BEND



DETAIL B



DETAIL A

REV	ECR	BY	DATE	DESCRIPTION
B	2521	JCVM	10/16/06	ADDED C15 AND C16 FOR GROUNDS, CHANGED GAUGE OF GROUND
A	2470	JB	10/07/05	Added 90 degree Deutsch boot.
–	2366	JB	06/27/05	Replaced single control head / dist. box harness

DRAWING NOTES:
UNLESS OTHERWISE SPECIFIED
1. ALL dimensions are in inches
2. Do not scale drawing
3. Decimal Tolerance
X.XX = +/-.01
X.XXX = +/-.005
X.XXXX = +/-.0005
4. Angle Tolerance .5 deg.

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FAX 352-629-2902

HARNESS DIST. BOX DUAL TANK MOTOR CONTROL

CAGE IDENT. NO.	COMPLETED	DRAWN BY	CHECKED	PROJECT
06CG4	06/27/05	JB	--	--

SIZE	DRAWING NUMBER	REV
B	113435	B
SCALE NONE		SHEET 1 OF 1

Notes

Note:

1) Lengths shown are the total distance from the rear of one connector to the rear of the next. See part number matrix for dimensions A and B.

2) Circuits marked with asterisk (*) use Beldon 9364 (3)-conductor 20ga shielded cable. Solder the drain to the Black wire at the Packard connector end as shown in Detail A.

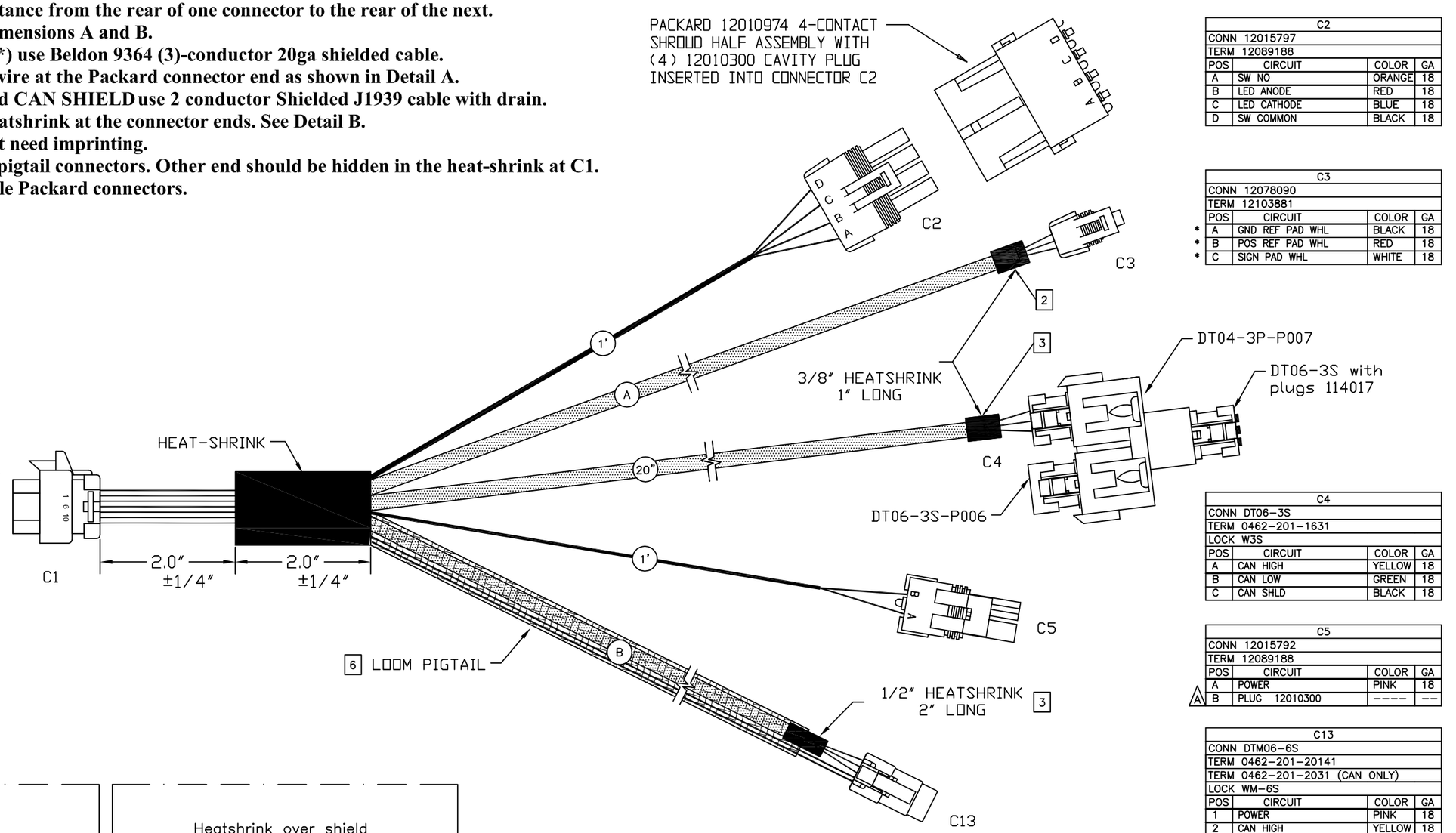
3) For CAN HIGH, CAN LOW, and CAN SHIELD use 2 conductor Shielded J1939 cable with drain. Insulate the drain with 1/8" heatshrink at the connector ends. See Detail B.

4) Circuits in shielded cable do not need imprinting.

6) Loom should be taped 1" from pigtail connectors. Other end should be hidden in the heat-shrink at C1.

7) Use seal #12015899 on applicable Packard connectors.

8) Label all connectors.



C1			
CONN AMP 776273-5			
TERM AMP 770520-3			
POS	CIRCUIT	COLOR	GA
1	POWER	PINK	18
2	GROUND	BLACK	16
3	SW NO	ORANGE	18
4	SW COMMON	BLACK	18
5	LED CATHODE	BLUE	18
6	LED ANODE	RED	18
7	POS REF PAD WHL	RED	18
8	SIGN PAD WHL	WHITE	18
9	GND REF PAD WHL	BLACK	18
10	CAN HIGH	YELLOW	18
11	PLUG 770678-1	–	–
12	PLUG 770678-1	–	–
13	PLUG 770678-1	–	–
14	CAN LOW	GREEN	18

A

C2			
CONN 12015797			
TERM 12089188			
POS	CIRCUIT	COLOR	GA
A	SW NO	ORANGE	18
B	LED ANODE	RED	18
C	LED CATHODE	BLUE	18
D	SW COMMON	BLACK	18

C3			
CONN 12078090			
TERM 12103881			
POS	CIRCUIT	COLOR	GA
* A	GND REF PAD WHL	BLACK	18
* B	POS REF PAD WHL	RED	18
* C	SIGN PAD WHL	WHITE	18

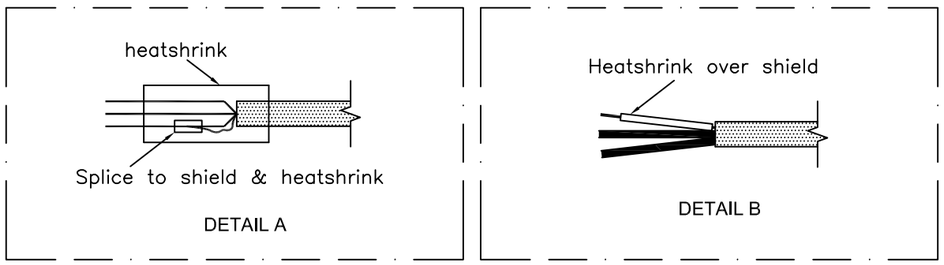
C4			
CONN DT06-3S			
TERM 0462-201-1631			
LOCK W3S			
POS	CIRCUIT	COLOR	GA
A	CAN HIGH	YELLOW	18
B	CAN LOW	GREEN	18
C	CAN SHLD	BLACK	18

C5			
CONN 12015792			
TERM 12089188			
POS	CIRCUIT	COLOR	GA
A	POWER	PINK	18
A B	PLUG 12010300	----	--

A

C13			
CONN DTM06-6S			
TERM 0462-201-20141			
TERM 0462-201-2031 (CAN ONLY)			
LOCK WM-6S			
POS	CIRCUIT	COLOR	GA
1	POWER	PINK	18
2	CAN HIGH	YELLOW	18
3	CAN SHLD	BLACK	18
4	GROUND	BLACK	16
5	CAN LOW	GREEN	18
6	PLUG 770678-1	–	–

A



PART NUMBER MATRIX				
		DIMENSION A		
		32"	10'	15'
DIMENSION B	4'	XXXXXX	113436	XXXXXX
	5.5'	113437	XXXXXX	XXXXXX
	14'	XXXXXX	113438	XXXXXX
	19'	XXXXXX	XXXXXX	113439

DRAWING NOTES:
UNLESS OTHERWISE SPECIFIED
1. ALL dimensions are in inches
2. Do not scale drawing
3. Decimal Tolerance
X.X = +/-.1
X.XX = +/-.06
X.XXX = +/-.030
4. Angle Tolerance .5 degrees.

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HARN FOAMLOGIX CTRL HEAD HARN

CAGE IDENT. NO.	COMPLETED	DRAWN BY	CHECKED	PROJECT
06CG4	07/14/05	JB	--	--

SIZE	FILE NAME	REV
B	113436, 113437, 113438, 113439.dwg	A
SCALE NONE		SHEET 1 OF 1

REV	ECR	BY	DATE	DESCRIPTION
A	2521	JCVM	10/19/06	TOOK GROUND OFF OF C5, CHANGED GAUGE OF GROUND
–	2366	JB	06/27/05	Replaced single control head / dist. box harness

Notes



Hale Products, Inc.
A Unit of IDEX Corporation
700 Spring Mill Avenue
Conshohocken, PA 19428
U.S.A.
Telephone 610-825-6300
Fax 610-825-6440
Web. .....*www.haleproducts.com*









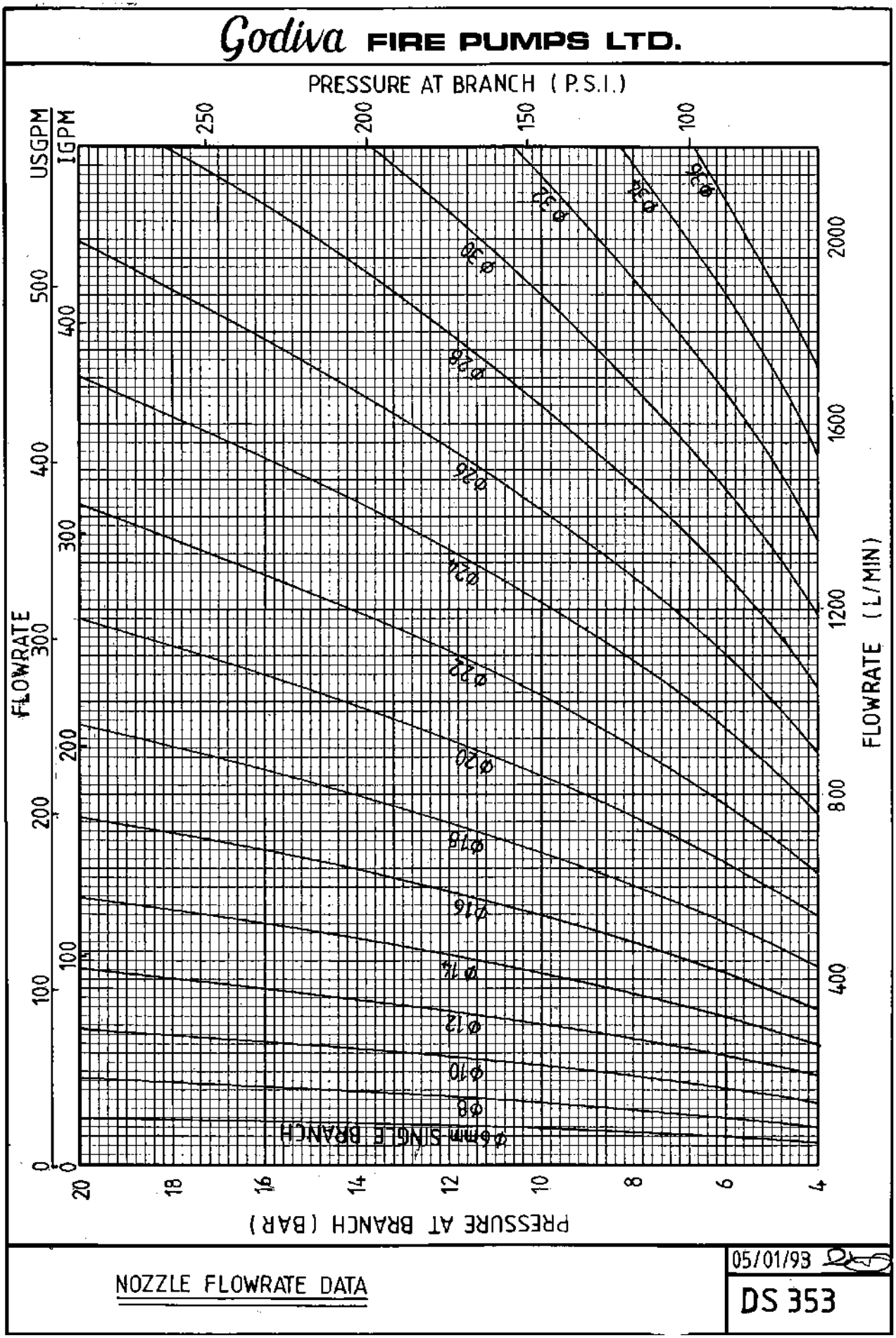




NOZZLE FLOWRATE CHART (DS353) ➞

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SUITABLE FOR EXTERNAL DISTRIBUTION

OPERATION MANUAL

4 LIGHT INTELLI-TANK
WITH 1-WIRE AND CAN COMMUNICATION



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OPERATION MANUAL

				PAGE	1 of 21
				DATE	2/26/2007
PRODUCT GROUP	ITL	P/N	12V: 113739 ; 24V: 114378	REV	1.10
PRODUCT	4 LIGHT INTELLI-TANK DISPLAY WITH 1-wire and CAN			BY	AMS

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OPERATION MANUAL

				PAGE	2 of 21
				DATE	2/26/2007
PRODUCT GROUP	ITL	P/N	12V: 113739 ; 24V: 114378	REV	1.10
PRODUCT	4 LIGHT INTELLI-TANK DISPLAY WITH 1-wire and CAN			BY	AMS

1. Revision Log

Rev	Date	Approved	Changes
1.00	12-12-2005		Initial requirements
1.10	2-26-2007	AK	Added CAN harness part numbers

2. System Overview

The Intelli-Tank 4 light tank level (ITL) is designed to display a liquid's volume to an eighth of a tank level accuracy through 180-degree viewable ultra-bright LEDs. The unit set as a Master uses a 0 – 5 PSI pressure transducer to obtain tank level information and then relays that information along the communication line(s) (1-Wire or CAN) to units set as Remotes. Multiple Remote units can be linked to the Master tank level unit.

2.1. Part numbers

Tank Level Gauge	C1 – p/n	113739	– **12V**
	p/n	114378	– **24V**
Labels	C1 – p/n	106280	– water
	p/n	106281	– foam
	p/n	106282	– foam A
	p/n	106283	– foam B
Pressure Transducer	C1 – p/n	102162	– 0 to 5 PSI gage
Adapter bushing	C1 – p/n	102219	– ¾ to ¼ NPT
Installation Harness	C1 – p/n	106690	– Master 1-wire
	p/n	106691	– Remote 1-wire
	p/n	116032-10	– Master CAN, 10 feet length
	p/n	116032-20	– Master CAN, 20 feet length
	p/n	116032-30	– Master CAN, 30 feet length
	p/n	116032-40	– Master CAN, 40 feet length
Terminating resistor (CAN)	C1 – p/n	DT06-3S-P006	
"Y" connector (CAN)	C1 – p/n	DT04-3P-P007	
Operation Manual	C1 – p/n	114356	

2.2. Modes of Operation

Master When the ITL display is calibrated with a proper pressure signal it automatically becomes a Master display and will send tank level information along the communication line(s) (either 1-wire or CAN) to all other Remote displays.

Remote ITL displays are initially shipped as Remote displays. A Remote display only requires power, ground and communications line(s) (either 1-wire or CAN). The Remote display mimics the Master display's LEDs by reading the appropriate information on the communication line(s).

3. Operation

3.1. LED indications

The ITL display uses the 4 LEDs to show the unit status (section 3.1.1), water level (section 3.1.2), and error conditions (section 3.1.3).

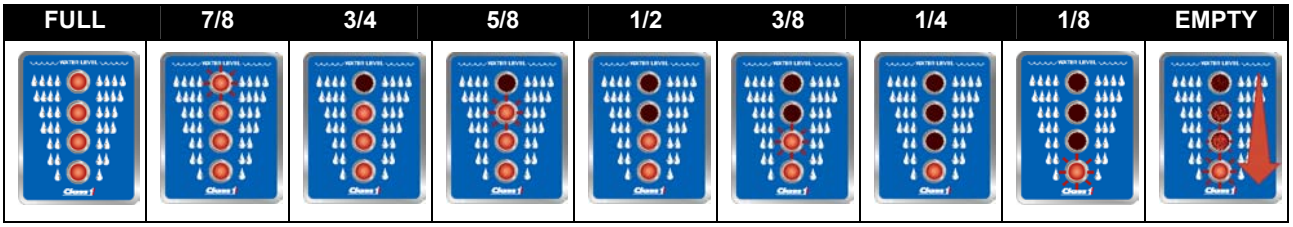
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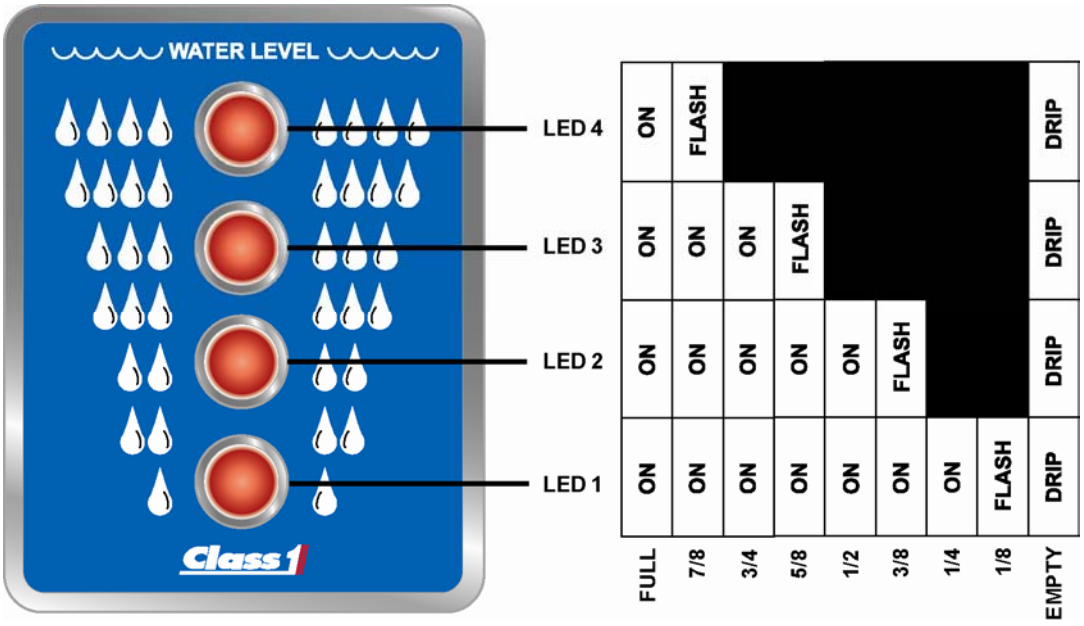
3.1.1. Initial power ON indications

When the display is first powered up the LEDs will cycle on individually starting with the bottom LED (LED 1) and then the LEDs will show current status.

- A **Master** display properly connected to a functioning transducer will display current tank level information.
- A **Master** display not connected to a pressure transducer will alternately flash the bottom two LEDs.
- A **Remote** display connected to a Master display (through the 1-wire or CAN communication line(s)) will mimic the Master display's LED condition and flash pattern.
- A **Remote** display not connected to a Master display will alternately flash the upper two LEDs and the lower two LEDs. This indicates a "no communication" condition.

3.1.2. Level indications

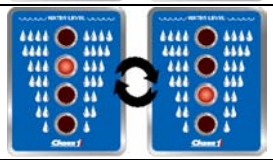
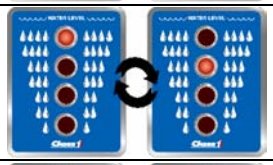
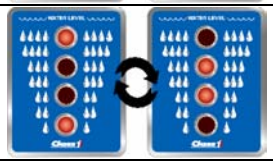




DRIP = cascades from top (LED 4) to bottom (LED 1), pauses, and repeats.

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3.1.3. Error indications

Condition	Visual
Invalid calibration	
Incomplete calibration	
EEPROM error	
Transducer signal voltage above 4.8V	
Transducer signal voltage below .4V	
Remote “NO DATA”	
Password Error “wave off” (1)	
Unit type error (2)	

(1) *“Wave off” pattern: two center LEDs and then two outer LEDs flashing quickly for 8 cycles.*
(2) *Indicates that the unit type has erroneously changed. The two valid unit types are Remote and Master.*

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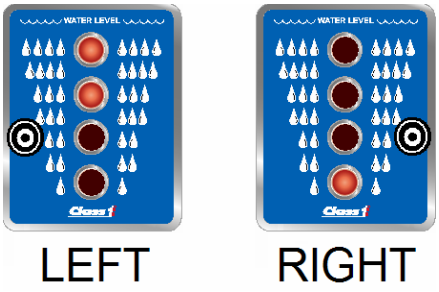
3.2. Magnetic switches

The display has two magnetic switches (left and right). The magnetic switches are activated by using a magnet and touching the front of the display on either side of LED 2.





For best results the magnet should be positioned over the desired magnet approximately 2 inches from the front of the display, pushed directly to the front of the display, and then pulled back to the start position.



The LEDs on the display will indicate which switch was activated (upper two LEDs = left switch, bottom LED = right switch) for approximately half a second and then the display will go blank.

The maximum time between magnetic switch activations is two seconds. If longer than two seconds have passed between activations the unit will resume normal operation and the password attempted will be reset.

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3.3. Calibration

The ITL display can be calibrated four different ways: 1-point (quick calibration), 2-point (level calibration), 5-point and 9-point (volume calibration).
To enter calibration mode use a magnet and activate the magnetic switches in the order of the appropriate password.



Entering an invalid password will initiate a "wave off" pattern on the display. (Two center LEDs, two outer LEDs flashing quickly for 8 cycles.) The unit will then resume its normal operation and the user can attempt to re-enter the password.

Calibrate the unit by entering the desired point calibration password –

1 point **RLLR LRRL** (see section 3.3.1)
2 point **RLLR LLRL** (see section 3.3.2)
5 point **RLLR LRLR** (see section 3.3.3)
9 point **RLLR RLLR** (see section 3.3.4)

During calibration, the process can be cancelled at any time by activating the **LEFT** magnetic switch. This will allow the display to exit without showing an "incomplete calibration error" (section 3.1.3) on the next power cycle.

3.3.1. 1 Point Calibration

1 point calibration only calibrates the full point. The empty calibration is always set to 0.55V (approximately 1.5 inches of liquid).

1. Make certain that the tank is FULL.
2. Enter the password **RLLR LRRL**. The display will respond by flashing the top LED twice. The display will then revert to normal operation by displaying FULL (all LEDs on).

3.3.2. 2 Point Calibration

1. Enter the password **RLLR LLRL**. The display will respond by flashing the two center LEDs twice. The display will then begin cascading the LEDs from top to bottom (drip).
2. Make certain that the tank is EMPTY and then activate the **RIGHT** switch to store that point. The display will flash the top LED and then turn on all four LEDs.
3. Fill the tank and then activate the **RIGHT** switch. The display will respond by flashing the top LED then lighting the two center LEDs and then reverting to normal operation by displaying FULL (all LEDs on).

3.3.3. 5 Point Calibration

1. Enter the password **RLLR LRLR**. The display will respond by flashing the two center LEDs five times. The display will then begin cascading the LEDs from top to bottom (drip).
2. Make certain that the tank is EMPTY and then activate the **RIGHT** switch to store that point. The display will flash the top LED and then turn on the bottom LED.
3. Fill the tank to the one-quarter tank point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on the bottom two LEDs.
4. Fill the tank to the one-half tank point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on the bottom three LEDs.

5. Fill the tank to the three-quarter tank point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on all four LEDs.
6. Fill the tank to the full point and then activate the **RIGHT** switch. The display will respond by flashing the top LED then lighting the two center LEDs and then reverting to normal operation by displaying FULL (all LEDs on).

3.3.4. 9 Point Calibration

1. Enter the password **RLLR RLLR**. The display will respond by flashing the two center LEDs nine times. The display will then begin cascading the LEDs from top to bottom (drip).
2. Make certain that the tank is EMPTY and then activate the **RIGHT** switch to store that point. The display will flash the top LED and then begin flashing the bottom LED.
3. Fill the tank to the one-eighth point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on the bottom LED.
4. Fill the tank to the one-quarter tank point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on the bottom LED and flash the second LED.
5. Fill the tank to the three-eighths point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on the bottom two LEDs.
6. Fill the tank to the one-half point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on the bottom two LEDs and flash the third LED.
7. Fill the tank to the five-eighths point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on the bottom three LEDs.
8. Fill the tank to the three-quarter point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on the bottom three LEDs and flash the fourth LED.
9. Fill the tank to the seven-eighths point and then activate the **RIGHT** switch. The display will flash the top LED and then turn on all four LEDs.
10. Fill the tank to the full point and then activate the **RIGHT** switch. The display will respond by flashing the top LED then lighting the two center LEDs and then reverting to normal operation by displaying FULL (all LEDs on).

3.3.5. Calibration retention

Calibration data is saved in non-volatile memory (EEPROM) and the display does not need power to retain calibration data.

3.3.6. Invalid calibration

Calibration automatically makes the display a master if the calibration is valid. An invalid calibration is determined when any calibrated point is not at a higher level than the previous calibrated point, or if the transducer voltage falls outside of the valid minimum (.4V) or maximum (4.8V) range. An invalid calibration is acknowledged by giving the “wave off” and if this was a master display previously will show an “invalid calibration error” (section 3.1.3), while a Remote will revert to Remote operation.

3.3.7. Calibration incomplete

If the calibration is not completed the display will continually flash the “incomplete calibration error” (section 3.1.3), during all subsequent power cycles. This indicates that a calibration was attempted but never completed. Recalibrate the display completely to remove this error condition.

3.4. Self test

The Tank Level can check its hardware for proper operation by entering the password **RLLR LLRR.**
The display will then cycle each LED ON individually starting with the bottom LED and then all LEDs will come on and begin flashing between full bright and the calibrated dim level for 5 seconds. The display will then show the condition of the self test for 5 seconds.

A **PASS** condition is indicated when only the top LED (LED 4) is on.

A **FAIL** condition exists if LED 4 is off and any other LED is on.

LED 3	ON	Memory (EEPROM) failure.
LED 2	ON	Data communication error.
LED 1	ON	Transducer signal line out of tolerance high (above 4.8V) or shorted to +5V.
LED 1	Flashing	Transducer signal out of tolerance low (below 0.4V) or shorted to ground.

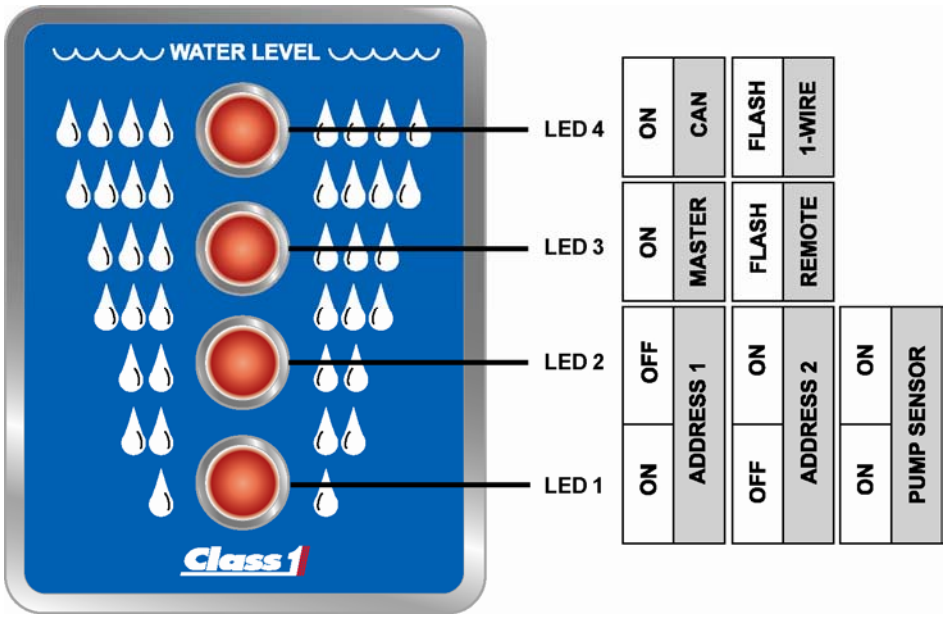
If the self test password is used on a Master display all Remote displays will also perform their self test.

3.5. Setting the dim LED level

The display can be dimmed by applying system power to pin 3 (Dim Display input). To select the dim level of the display use the magnetic switches to enter the password **RLLR LLLR.**
All of the LEDs will be illuminated during the set-up. Hold the magnet against the **RIGHT** switch and the display will either brighten or dim. Release the magnet and again hold it against the **RIGHT** switch and the display's brightness will move in the opposite direction. When the dim level is at the desired point activate the **LEFT** switch.

3.6. Show display type and address indications (CAN communication)

Hold a magnet to the right magnetic switch during power up and the LED states will verify the display type, display address, and communication method.
LED 4 shows the communication method, LED3 shows the display type, and LEDs 2 and 1 show the CAN communication address.



3.7. Configuring the communication method

A Master display can communicate to other displays that are configured as remotes via CAN or 1-wire.
The 1-wire communication method was used on the original ITL displays. Use this method if older ITL displays will be utilized along with the new display. This method also only uses 1 communication wire (make certain that all displays on the 1-wire communication line have the exact same ground potential).

The CAN communication method is new for the ITL displays and is a more robust communication method. This method requires two wires (CAN high, CAN low) and approved J1939 CAN wiring and connectors. There should be two 120 ohm terminating resistors located at the ends of the CAN bus.

3.7.1. Configuring a display as a Master with 1-wire communications

Enter the password **LRLL LLLR** to set the communication method to 1-wire. If the display was not previously a Master display, calibrate the display (see section 3.3).

3.7.2. Configuring a display as a Remote with 1-wire communications

Enter the password **LRLL LLLR** to set the communication method to 1-wire. If the display is a Master display, enter the password **LRLR LRLR** to turn the display into a Remote.

3.7.3. Configuring a display as a Master with CAN communications

Enter the password **LRLL LLRL** to set the communication method to CAN. If the display was not previously a Master display, calibrate the display (see section 3.3).
Choose the CAN identification address to use (either address 1, 2, or 3) and enter the appropriate password to set the address (**LRRR LLLL** address 1**, LRRR LLLR** address 2, **LRRR LRRR** address 3). All Remote displays that are to mimic this Master display must have their addresses matching the Master's.

3.7.4. Configuring a display as a Remote with CAN communications

Choose the CAN identification address to use (either address 1, 2, or 3) and enter the appropriate password to set the address (**LRRR LLRL** address 1**, LRRR LLRR** address 2, **LRRR LRRL** address 3). All Remote displays that are to mimic the Master display must have their addresses matching the Master's.
The display can also be configured to mimic a Class 1 Pump Sensor Module by entering the password (**LRRR LRLL**).

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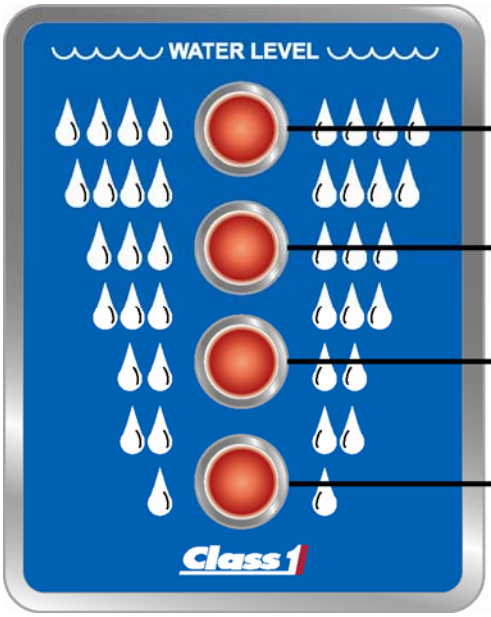
4. Password list

RLLR LRRL	**1 point calibration (section 3.3.1)**
RLLR LLRL	**2 point calibration (section 3.3.2)**
RLLR LRLR	**5 point calibration (section 3.3.3)**
RLLR RLLR	**9 point calibration (section 3.3.4)**
RLLR LLRR	**Self test (section 3.4)**
LRLR LRLR	**Configure display as Remote display (section 2.2)**
RLLR LLLR	**Configure dim level (section 3.5)**
LLRR LLRR	**Display voltage (section 8.2)**
LRLL LLLR	**Configure for 1-wire communications (section 3.7)**
LRLL LLRL	**Configure for CAN communications (section 3.7)**
LRRR LLLL	**Configure as Master display with CAN address 1 (section 3.7.3)**
LRRR LLLR	**Configure as Master display with CAN address 2 (section 3.7.3)**
LRRR LRRR	**Configure as Master display with CAN address 3 (section 3.7.3)**
LRRR LLRL	**Configure as Remote display with CAN address 1 (section 3.7.4)**
LRRR LLRR	**Configure as Remote display with CAN address 2 (section 3.7.4)**
LRRR LRRL	**Configure as Remote display with CAN address 3 (section 3.7.4)**
LRRR LRLL	**Configure as Remote display for use with Pump Sensor Module (Tank 1)**
LRRR RLRL	**Configure as Remote display for use with Pump Sensor Module (Tank 2)**
LRRR RLRR	**Configure as Remote display for use with Pump Sensor Module (Tank 3)**

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5. Software revision check

Hold a magnet on the **LEFT** magnetic switch while powering the display. The LEDs will display the software revision. (Use the chart below to decipher).



MAJOR REVISION NUMBER				
	0	1	2	3
LED 4	OFF	OFF	ON	ON
LED 3	OFF	ON	OFF	ON

MINOR REVISION NUMBER				
	0	1	2	3
LED 2	OFF	OFF	ON	ON
LED 1	OFF	ON	OFF	ON

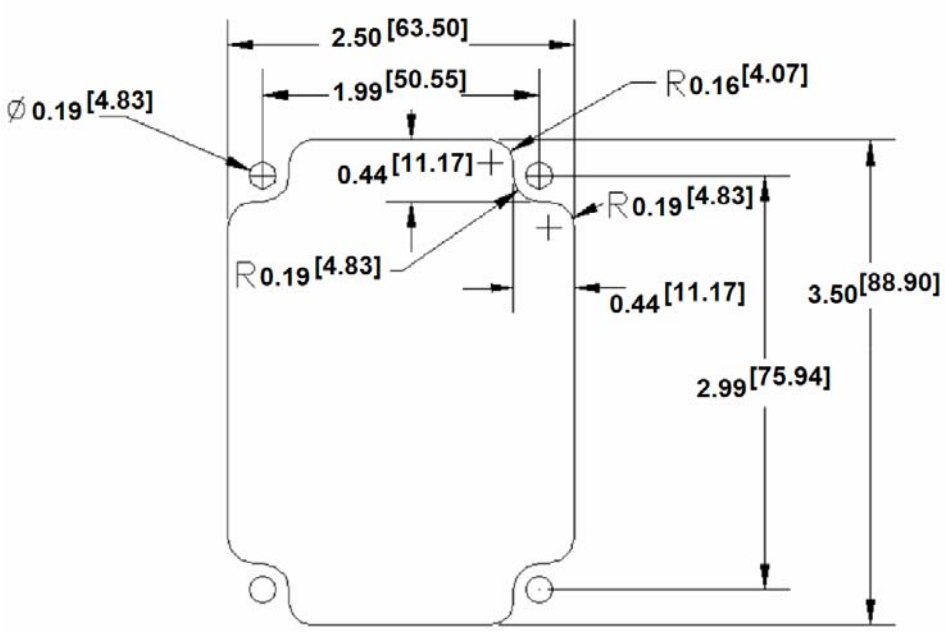
Example. (LED 4 – OFF, LED 3 – ON, LED 2 – OFF, LED 1 – ON) = Ver 1.1

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6. Installation

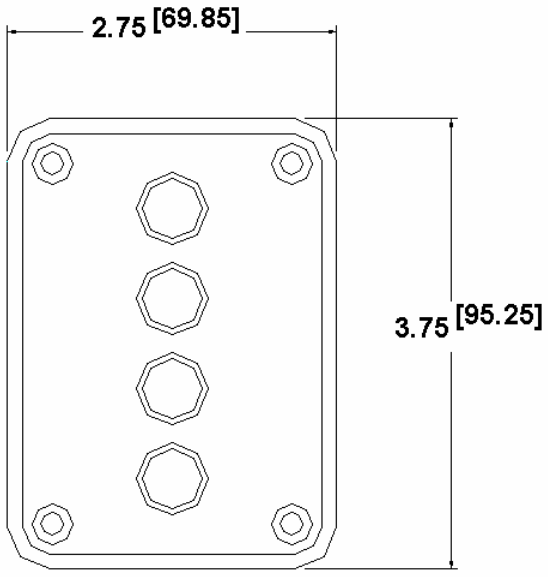
6.1. Cutout dimensions

The display requires a cutout as shown. The display is water tight and may be mounted in any location on the operator's panel.



Unit of scale: inches [millimeters]

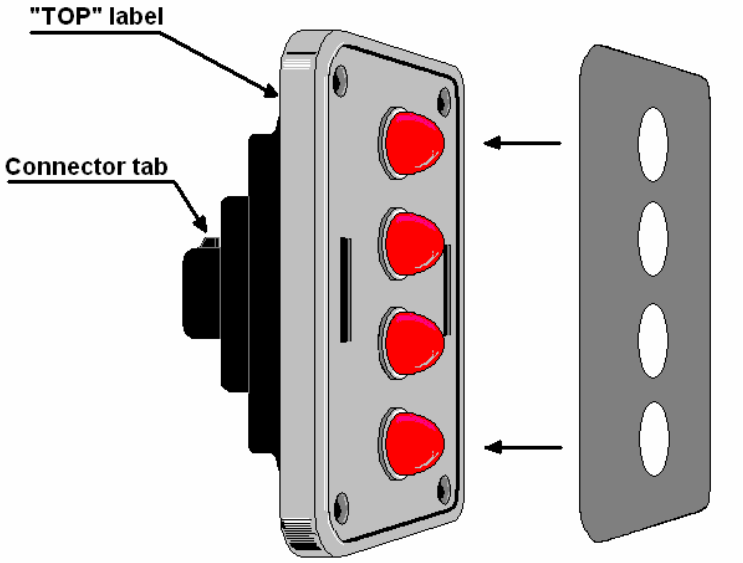
6.2. Outer bezel dimensions



Unit of scale: inches [millimeters]

6.3. Label orientation

Before mounting the display and adhering the label insure that the display is situated correctly (TOP is UP). Refer to the drawing for orientation.

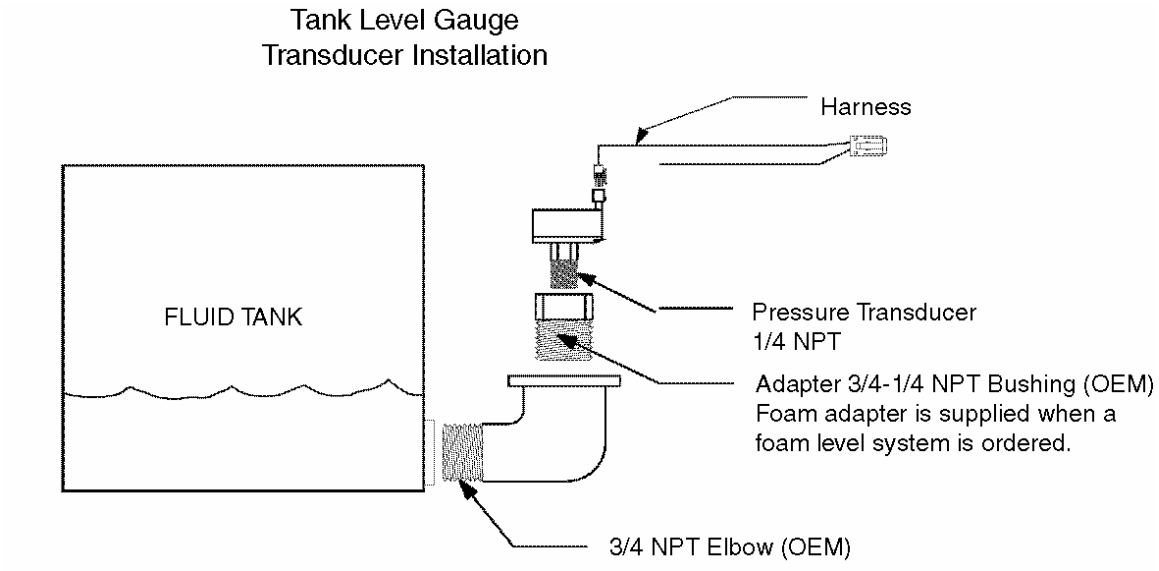


6.4. Pressure transducer

The transducer has a ¼" NPT mount and must be mounted vertically as depicted to insure an accurate reading.

6.4.1. Approved fluids

The pressure transducer has been tested and approved for water, foam A, and foam B.



7. Wiring

7.1. Power and Ground

It is imperative that a system utilizing Master and Remote tank level displays connected by the 1-wire data line have a common ground. The remote displays will not follow the master display otherwise.

Pin 1 System voltage
Pin 2 Ground

7.2. Dim Function

The LEDs on the tank level display can be dimmed to a user selectable dim setting by applying system voltage to the Dim display Input.

Pin 3 Dim display input (system voltage)

7.3. Transducer Connection

Pin 6 Sensor power (+5)
Pin 7 Sensor signal
Pin 8 Sensor ground

7.4. Communication Data Line(s)

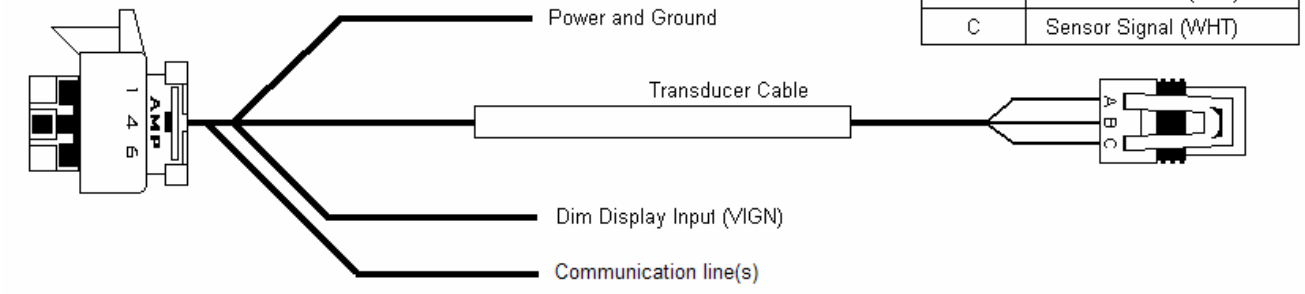
Pin 4 CAN high communication line (or 1-wire communication line)
Pin 5 CAN low communication line

CONNECTOR: AMP 776286-1 PINS: AMP 770520-1

POS	WIRE DESCRIPTION	
1	Power	(input)
2	Ground	(input)
3	Dim Display (VIGN)	(input)
4	1-Wire or CAN high	(I/O)
5	CAN low	(I/O)
6	Sensor Power (+5V)	(output)
7	Sensor Signal	(input)
8	Sensor Ground	(output)

Communication lines (1-wire method only uses pin 4)

POS	WIRE DESCRIPTION
A	Sensor Power +5V (RED)
B	Sensor Ground (BLK)
C	Sensor Signal (WHT)

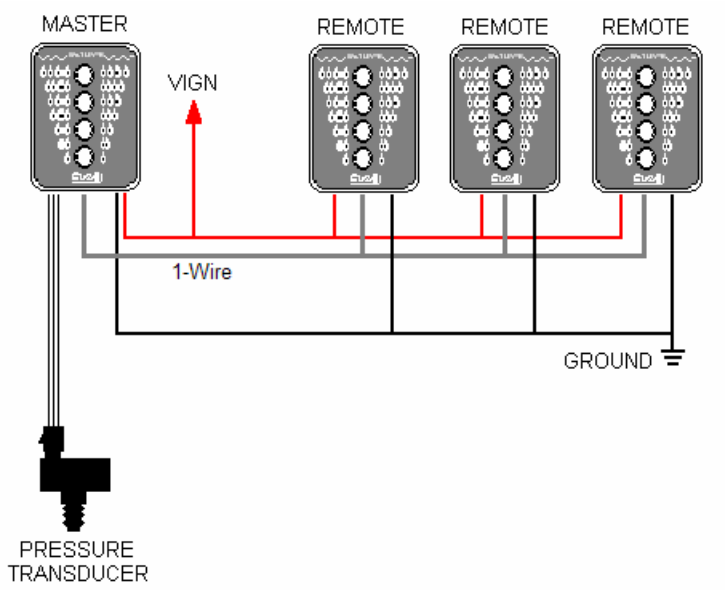


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7.5. Communication wiring examples

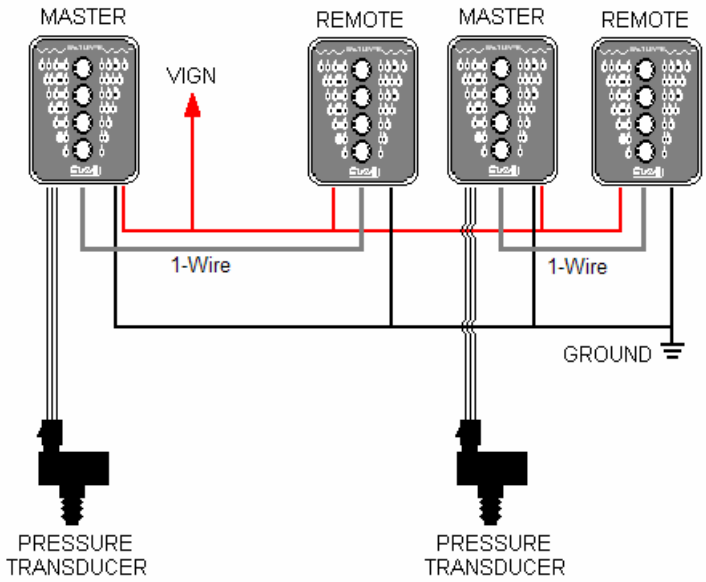
The displays can be set up to use the 1-wire or CAN communication methods. A standard system could be comprised of as few as 1 master display. Two master displays may be used in a system where two fluid levels must be displayed *(for example, 1 water tank and 1 foam tank).*

7.5.1. 1-wire method, 1 master and 3 remotes



System configured with 1-wire communication method. Make certain that the ground for each display is tied to a common point or the remote displays will not follow the master display.

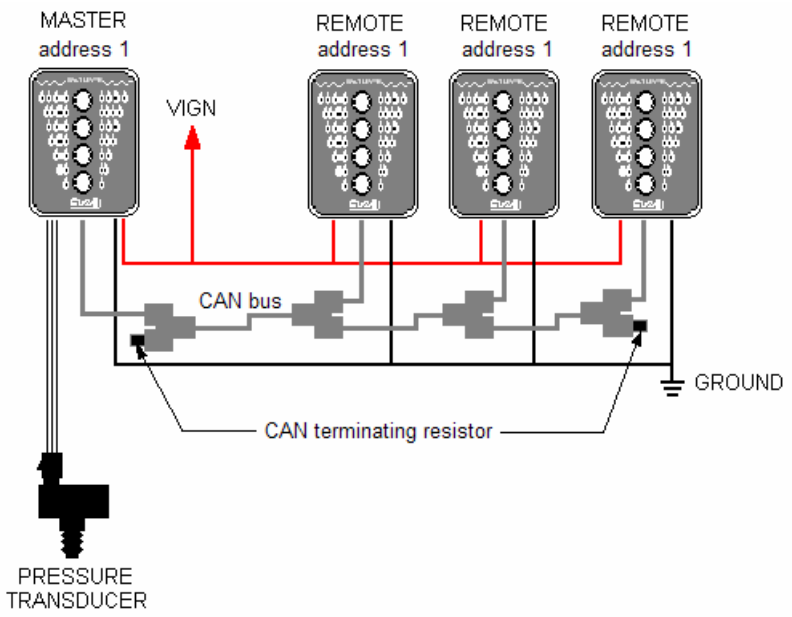
7.5.2. 1-wire method, 2 masters and 2 remotes



System configured with 1-wire communication method. Make certain that the two master 1-wire data lines are not connected and that the ground for each display is tied to a common point or the remote displays will not follow the master displays.

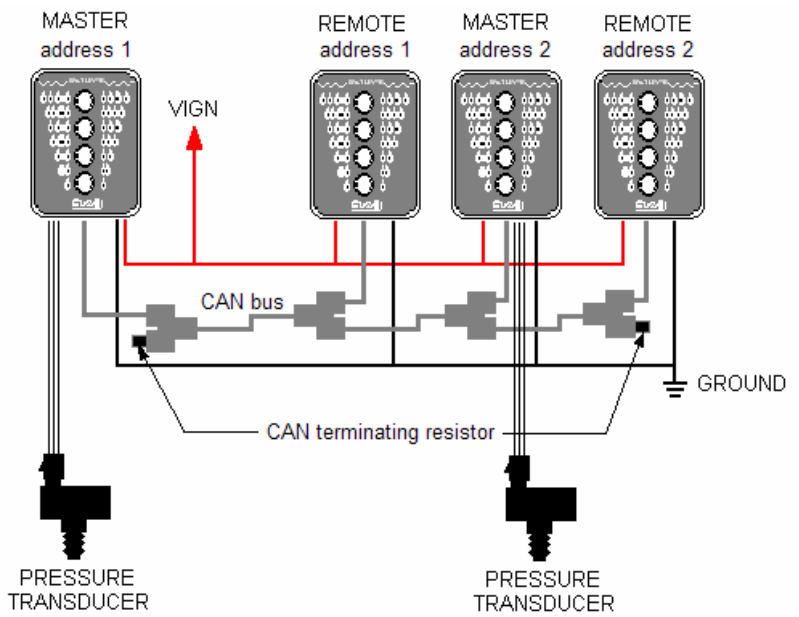
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7.5.3. CAN method, 1 master and 3 remotes



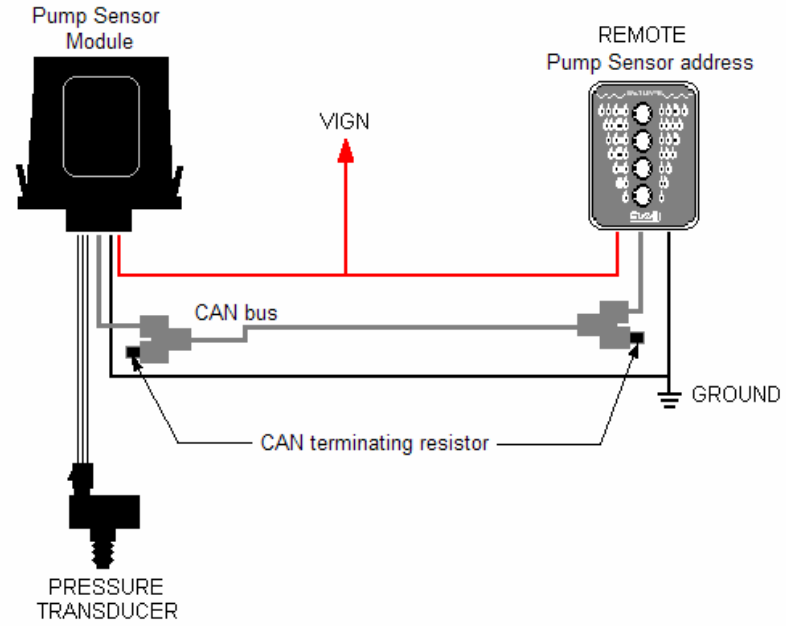
System configured with CAN communication method. This example shows one master display (address 1) communicating with 3 remote displays (address 1).

7.5.4. CAN method, 2 masters and 2 remotes



System configured with CAN communication method. This example shows two master displays (address 1 and 2) communicating with 2 remote displays (address 1 and 2). Remote display address 1 only follows the indications of master display address 1, and remote display address 2 only follows the indications of master display address 2.

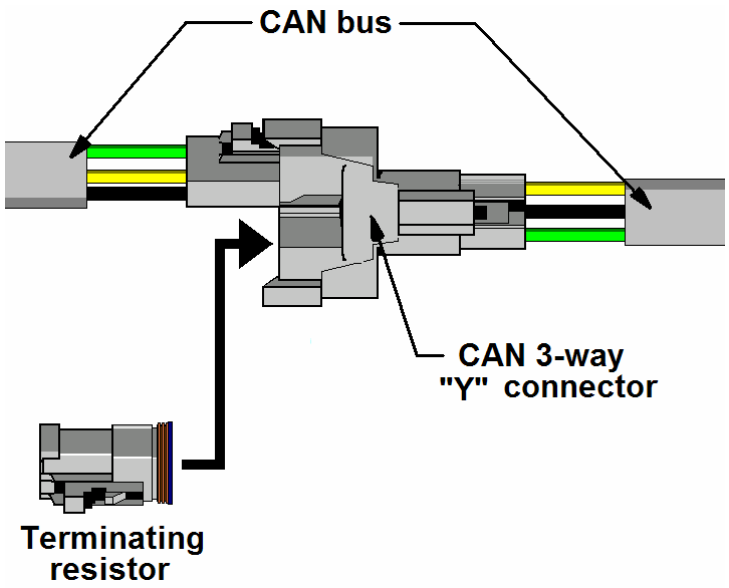
7.5.5. CAN method, pump sensor module and 1 remote



System configured with CAN communication method. This example shows one remote display (using pump sensor module address) following the indications of the Class 1 Pump Sensor Module.

7.5.6. Terminating resistor requirement (CAN communication)

A terminating resistor (120 Ohm) is required on both ends of the CAN bus for proper operation. Only two terminating resistors are allowed on a CAN bus.



Terminating resistor p/n DT06-3S-P006
CAN “Y” connector p/n DT04-3P-P007

7.6. System compatibility

The ITL display is compatible with other Class 1 CAN and 1-wire products.

7.6.1. 1-wire compatibility

An ITL display configured with 1-wire communication is compatible with the 4 light remote driver module (p/n 106877), Pump input sensor module (p/n 111097), mini remote driver module (p/n 112648), mini remote dash gauge (p/n 112649), and all older 4 and 5 light ITL displays (p/n 106299, 106296, 108858, 108859).

7.6.2. CAN compatibility

The ITL display configured with CAN communications is compatible with the Command Master (p/n 111084, 111085, 111086), Pump input sensor module (p/n 111097), and future Class 1 ES-Key CAN products.

8. Troubleshooting

8.1. Evaluation table

Condition	Visual	Evaluate
Bottom two LEDs alternate flashing. Unit fails self test, LED 1 flashing.		Check transducer wiring. Ensure +5V at pin A, ground at pin B and at least .4V at pin C (Signal).
Top two LEDs alternate flashing. Unit fails self test, LED 1 on.		Check transducer wiring. Ensure +5V at pin A, ground at pin B and no more than 4.8V at pin C (Signal).
Middle two LEDs alternate flashing.		Perform self test. If it fails with LED 3 on replace display.
Outer two LEDs alternate flashing.		Try to recalibrate. If condition remains, check if transducer signal voltage (pin C) changes as tank level increases. If it doesn't, replace transducer. If it does, verify depth of tank. It may be impossible to calibrate a tank with a depth of less than 6 inches.
Bottom two and Upper two LEDs alternate flashing.		The display is configured as a Remote. Recalibrate if a Master is required. If the display is required to be a Remote check Data line(s) (Pin 4, 5) continuity and insure line(s) is(are) not grounded.
No LEDS on.		Check power (Pin 1) and ground (Pin 2) connection.

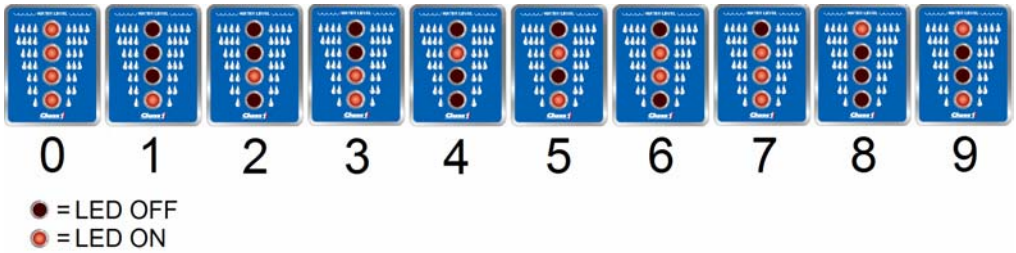
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Condition	Visual	Evaluate
Master Tank level unit does not change when actual tank level is changing.	No picture	Check transducer wiring. Ensure transducer signal voltage (Pin C) is varying. If it does, check for same signal changes at Pin 6 of tank level connector (if it is not the same repair wiring). If signal is good at both locations try re-calibrating.
Remote Tank level unit does not follow Master display.	No picture	Perform self test. If self test is good, check pin 4 (data line) for continuity and insure it is not shorted to ground or power. Insure data line is not routed near noisy power or RF sources.
Unit fails self test, LED 2 on.		Check pin 4 (data line) for continuity and insure it is not shorted to ground or power.
No passwords are accepted.		If the display issues the "wave off" after entering a password, insure the display is installed upright. During power-up the display should cycle on each LED individually starting with the bottom LED. Check that the left and right magnetic switches are recognized by activating each switch and verifying that the associated LEDs illuminate.
The bottom two LEDs are on and occasionally they go out and the top two flash and then return to the bottom two LEDs on (or vice-versa). (REMOTE).		Check for large noise spikes on the 1-wire data line. Insure that the display's ground potential is the same as the Master's. Insure that the data line is not chaffed and making contact with other electrical wires.
The points calibrated seemed to have changed.	No picture	Self test the display to check for any malfunctions. Check the pressure transducer for problems. Recalibrate the display and take a voltage reading from the transducer (pin 7 on the display's connector) at each calibration point. When the calibration points again look wrong check the voltages at those points and determine if they are the same as the voltage reading taken during calibration.
Unit will not dim display.	No picture	Insure the Dim input voltage on Pin 3 is at least 9V. Recalibrate dim setting (**RLLR LLLR**). If display does not dim LEDs while in dim calibrate mode, replace display.
The middle two LEDs are flashing together.		A calibration was started on the display but not completed correctly. Set the display to a REMOTE display (LRLR LRLR) or calibrate it as a MASTER (follow calibration steps exactly).
Top LED is the only LED illuminated.		The display has had a unit type memory error. Attempt to set the display back to REMOTE or MASTER as required.

8.2. Using the display to verify voltage

The display can show the voltage level that it detects on the transducer signal line by entering the password **LLRR LLRR**.

The display will then cycle through three LED patterns, pause, and then repeat. The three patterns each equate to a digit of the detected voltage. For example, if the three patterns shown were 1, 4, and 7, the voltage would be 1.47 volts.



The display will continue showing the voltage until either of the magnetic switches is activated.

9. Glossary

LED	Light Emitting Diode. The lights on the display used to show tank level and information.
ITL	Intelli-Tank Level. The tank level display.
PSI	Pounds per Square Inch. Pressure measurement.
CAN	Controller Area Network. SAE J1939 communication method.
NPT	Normal Pipe Taper. Pipe thread specification.
EEPROM	Electrically Erasable Programmable Read-Only Memory. The memory of the tank level display, used to store the display information (tank level points, display type, dim value, etc).
OEM	Original Equipment Manufacturer.
SAE	Society of Automotive Engineers.
TBD	To Be Developed.
ESD	ElectroStatic Discharge.
IP	Ingress Protection (IP 67, etc).
p/n	part number
C1	Class 1
Master	Master display. The tank level display wired to the transducer. This display transmits data to other remote displays.
Remote	Remote display. A tank level display that receives data from the master unit. The remote display will only display what the master display commands.
1-wire	Proprietary communication method that uses only one wire for data transfer.
System voltage	The normal power level used by the system or vehicle. This voltage level will normally come from the vehicle's battery and charging system (vehicle ignition, vehicle power, etc.)
Sensor	The pressure transducer.
Foam A	Class "A" type foam used when fighting fires where the cooling effect of water is of prime importance in extinguishing (wood, paper, etc.)
Foam B	Class "B" type foam used when fighting fires involving flammable liquids where blanketing or smothering effect of water is of prime importance in extinguishing (gasoline, etc.)

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10. Technical details

Product category	ITL (Intelli-tank level)
Voltage range	+9VDC…+16VDC (12V display p/n 113739) +9VDC…+32VDC (24V display p/n TBD) LEDs will be dimmer at voltages less than 16V.
Power consumption @13.8VDC @27.6VDC	 205 mA (12V display p/n 113739) TBD mA (24V display p/n TBD)
Operational temperature range	-40ºC…+85ºC
Environmental range	IP 67
CAN specification	SAE J1939 proprietary, 250 Kbits/second
1-Wire specification	Class 1 proprietary, 425 bits/second
Protection	Internal thermal fuse Reverse voltage protection (pins 1 and 2 of connector) CAN buses protected to 24V ESD voltage protected to SAE J1113 specification for heavy duty trucks Transient voltage protected to SAE J1113 specification for heavy duty trucks
Dimensions (W x H x D) in inches	2.75 x 3.75 x 2.06
Weight in ounces	6.7

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FORM-ENG-0014 REV C 01-26-06

Class 1 / IDEX	PRODUCT / SERVICE BULLETIN		BULLETIN#	0028
607 NW 27th Ave Ocala, FL 34475 Ph: 352-629-5020 or 1-800-533-3569 Fax: 352-629-290 or 1-800-520-3473			REVISION	1
	PRODUCT	FOAMLOGIX 2.1A & 1.7AHP SYSTEMS	PAGE	1 OF 2
	SUBJECT	FOAM FLOW SENSOR REPLACEMENT INSTRUCTIONS	DISTRIBUTION	X INTERNAL X EXTERNAL

1 REPAIR KITS 120421 & 120421-01 INCLUDE:

- Brass Housing with sensor & ball valve
- Two o-rings (040-0340-00-0)
- 121628 - Product/Service Bulletin 0028

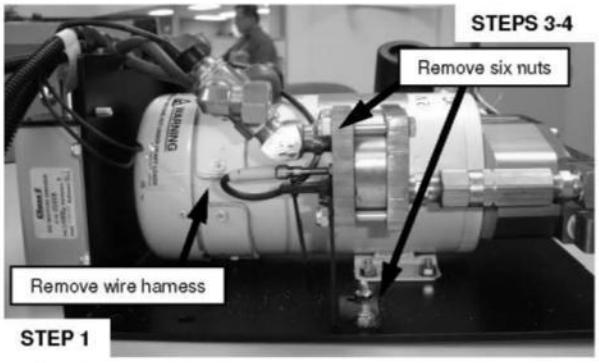
2 REQUIRED TOOLS:

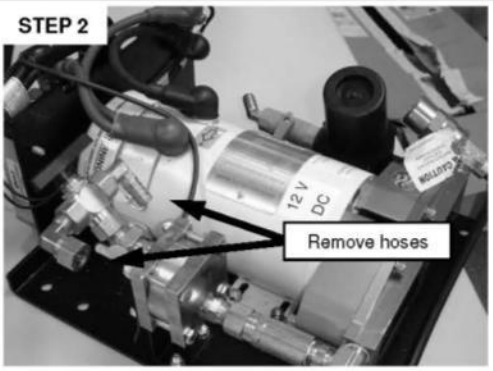
- 7/16" wrench (2X)

3 SAFETY INFORMATION

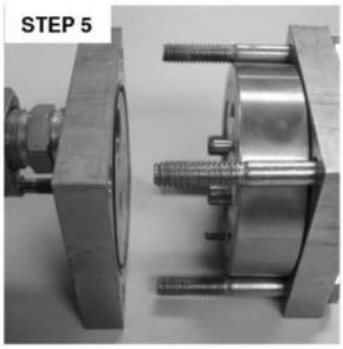
- Remove system power from the FoamLogix system and relieve any trapped pressure.
- Shut off foam tank supply valve.
- Open bypass valve to drain foam lines and use suitable containers to collect residual foam concentrate.
- Protect eyes and skin from foam concentrate per manufacturer's Material Safety Data Sheet or MSDS.

4 REPLACEMENT INSTRUCTIONS





1. Carefully disconnect the wire harness from the old foam flow sensor.
   - Connect the NEW foam flow sensor to the wire harness.
   - Apply system power and verify sensor diagnostic LED is off.
   - Touch end of sensor to brass housing → LED should light.
   - Disconnect the wire harness from the new sensor.
   - Remove system power from the FoamLogix system.
   - (This test verifies that the new sensor is operating correctly.)
2. Disconnect both hoses from the 3-way bypass valve.
3. Remove the four (4) nuts on the brass flowmeter assembly with the two 7/16" wrenches.
4. Remove the two (2) nuts on the bracket bottom with the 7/16" wrench.
5. Remove the sensor side brass cover of the flowmeter assembly.
   - Inspect o-ring inside the cover for damage or cuts. If the o-ring is damaged, replace it with a new one from this kit.
   - Depending on the return instructions provided by the dealer or manufacturer, it may be necessary to return the old sensor. If not, then the sensor and brass cover can be discarded.
6. Remove and inspect the two plastic rotors inside the flowmeter assembly for cracks, burrs, etc.
7. Inspect the inner housing for debris, metal shavings, etc. and remove as necessary.



IDEX FIRE SUPPRESSION GROUP

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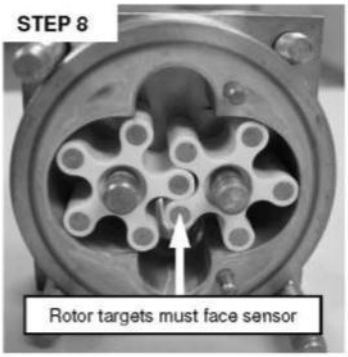
Class 1 / IDEX 607 NW 27th Ave Ocala, FL 34475 Ph: 352-629-5020 or 1-800-533-3569 Fax: 352-629-290 or 1-800-520-3473	PRODUCT / SERVICE BULLETIN		BULLETIN#	0028
			REVISION	1
	PRODUCT	FOAMLOGIX 2.1A & 1.7AHP SYSTEMS	PAGE	2 OF 2
	SUBJECT	FOAM FLOW SENSOR REPLACEMENT INSTRUCTIONS	DISTRIBUTION	X INTERNAL X EXTERNAL

8. Reinstall both rotors, making sure that each spins freely without binding.

   When installed, the flush end of the metal targets in the rotors must face out, toward the foam flow sensor.

9. Reinstall the o-ring (if necessary) and attach the new brass cover (with foam sensor protective bracket) and the lower support bracket with the six (6) nuts.
   - Tighten all nuts securely and torque to a maximum 6.5 ft-lb (8.5 N-m). Use a criss-cross torque pattern on the four brass housing nuts and bolts.
10. Reattach foam lines and foam flow sensor harness to the new sensor bulkhead connector.
11. Apply system power to the FoamLogix system and recalibrate the system per the user manual instructions.

STEP 8



REV	DATE	BY	DESCRIPTION
A	10/08/10	AJG	ORIGINAL RELEASE



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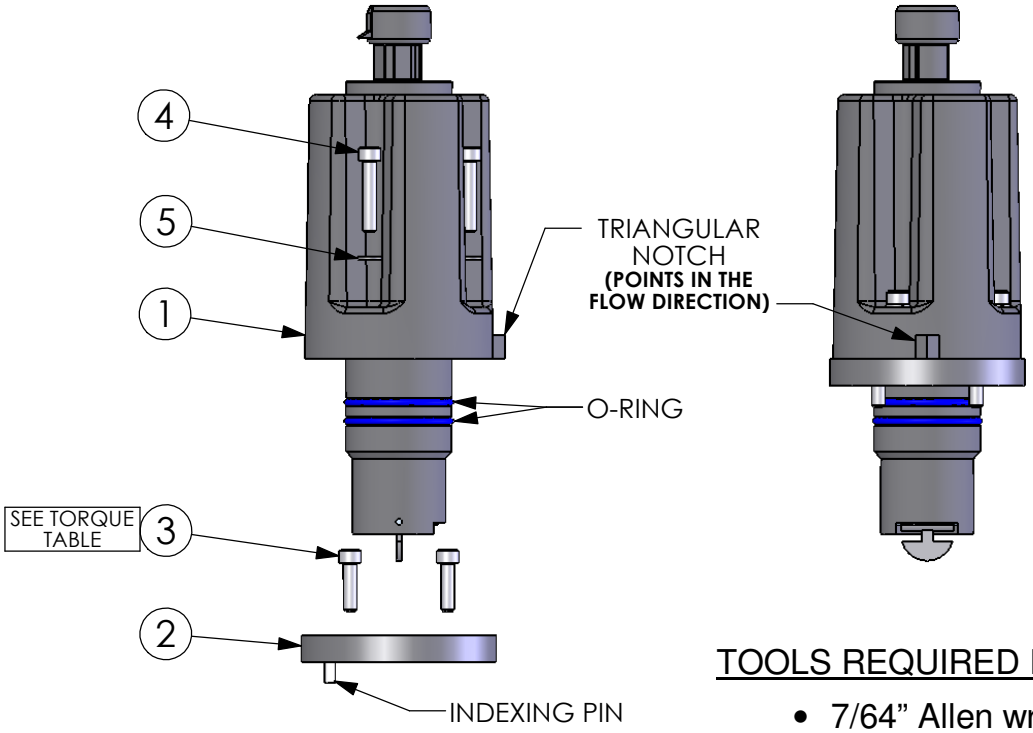
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PADDLEWHEEL FLOW SENSOR INSTRUCTIONS ➞

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PADDLEWHEEL FLOW SENSOR INSTALLATION (P/N 102714 & 115693)



ITEM NO.	DESCRIPTION	QTY.
1	PADDLEWHEEL FLOW SENSOR	1
2	ADAPTER RING (SPACER)	1
3	6-32 x 1/2" SOCKET HEAD CAP SCREW	4
4	6-32 x 3/4" SOCKET HEAD CAP SCREW	4
5	#6 INTERNAL TOOTH LOCK WASHER	4

PARTS LIST

TORQUE SPECIFICATION FOR 6-32 x 1/2" SOCKET HEAD CAP SCREWS		
MOUNT MATERIAL	TORQUE	
	in-lbs	Nm
ALUMINUM	5.3	0,60
BRASS	7.9	0,89
STEEL	9.0	1,02
STAINLESS STEEL	9.6	1,09
SADDLE CLAMP	8.5	0,96

TORQUE TABLE

TOOLS REQUIRED FOR INSTALLATION:

- 7/64” Allen wrench
- Torque wrench with 7/64” bit

INSTALLATION STEPS:

1. Attach spacer [Item 2] to flange or manifold.

a. Align spacer indexing pin with flange/manifold indexing hole.

b. Use four 6-32 x 1/2" socket head cap screws [Item 3] - see torque table at left.

2. Attach paddlewheel [Item 1] to spacer [Item 2].

a. Insert paddlewheel into spacer & orient paddlewheel so that **triangular notch** is pointing in the **flow direction**.

b. Align the four holes in paddlewheel with the threaded brass inserts on spacer.

c. Use four 6-32 X 3/4" socket head cap screws [Item 4] with #6 internal tooth lock washers [Item 5] - *torque to 7.5 inch-pounds (0,85 Nm).*

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SUITABLE FOR EXTERNAL DISTRIBUTION

TECHNICAL PRODUCT DATASHEET

SmartCAFS INTERLOCK MODULE

P/N 114631

smart CAFS



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TECHNICAL DATA SHEET

				PAGE	1 OF 11
				DATE	4-28-2009
PRODUCT GROUP	FOAM / CAFS	P/N	114631	REV	1.50
PRODUCT	SmartCAFS INTERLOCK MODULE			BY	AMS

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TECHNICAL DATA SHEET

1. Revision Log

Rev	Date	Changes
1.00	2-14-2006	Initial requirements
1.10	2-22-2006	Added Air Enable input to Compressor Enable output's logical expression
1.20	4-3-2006	Changed product name to SmartCAFS
1.30	9-29-2006	Updated "Force to Wet" operation
1.40	5-7-2007	Added RoHS declaration sheet.
1.50	4-28-2009	Air injection enable foam flow requirement changed from "foam flow active for 3 seconds" to "foam flow is active".

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2. Module Overview

2.1. Scope

The SmartCAFS interlock module (C1 P/N 114631) is a solid-state interlock module with two digital inputs (ground polarity), one temperature input, three low current ground polarity outputs, and J1939 CAN communication. The SmartCAFS interlock module is a component in the compressor based, smart CAF system and is designed for use with the Class 1 DC Motor Driver (C1 P/N 110586), Foamlogix display head (C1 P/N 111530), and SmartCAFS SPS panel (C1 P/N 114643).

2.2. Digital inputs

The SmartCAFS interlock module has two digital inputs.

- Pin 4 is the ***AIR ENABLE*** input and is ACTIVE with an applied ground.
  - When this input is toggled ON the interlock module transmits a CAN message to enable the FoamLogix display to begin flowing foam.
  - When this input is toggled OFF the interlock module transmits a CAN message to disable the FoamLogix display from flowing foam.
- Pin 5 is the ***AIR PRESSURE DETECT*** input and is ACTIVE with an applied ground. This input is used with a normally-open pressure detect switch (P/N 53635/02).
  - Three seconds after this input is toggled OFF the interlock module transmits a CAN message requesting the SPS Panel to drive the KZCO actuator to the OEM configured OPEN (WET) position.

2.3. Low current outputs

The SmartCAFS interlock module has 3 ground polarity outputs capable of up to 500 milliamps each.

- Pin 8 is the ***COMPRESSOR OIL TEMPERATURE WARNING*** output and it is ACTIVE when:
  - Compressor temperature is greater than 105ºC for 3 seconds or longer
- Pin 9 is the ***COMPRESSOR ENABLE*** *(Clutch Engage)* output and it is ACTIVE when:
  - Compressor temperature is less than 110ºC and
  - AIR ENABLE input is ACTIVE.
- Pin 10 is the ***AIR INJECTION ENABLE*** output and is ACTIVE when all of the following conditions are met:
  - Foam flow is ACTIVE *(CAN message from DC motor driver)*
  - FoamLogix display is ENABLED[(1)] *(CAN message from FoamLogix display)*
  - Water flow is ACTIVE *(CAN message from FoamLogix display)*
  - Foam tank A or B is SELECTED *(CAN message from DC motor driver)*
  - Selected foam tank is not LOW *(CAN message from DC motor driver)*
  - Air pressure detect is ACTIVE *(physical input on pin 5)*

[(1)] *The "FoamLogix display is ENABLED" CAN message is activated after the interlock module issues the FoamLogix display a CAN request message to enable the foam system. This request is transmitted when the AIR ENABLE input (pin 4) is toggled ON.*

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2.4. Temperature input

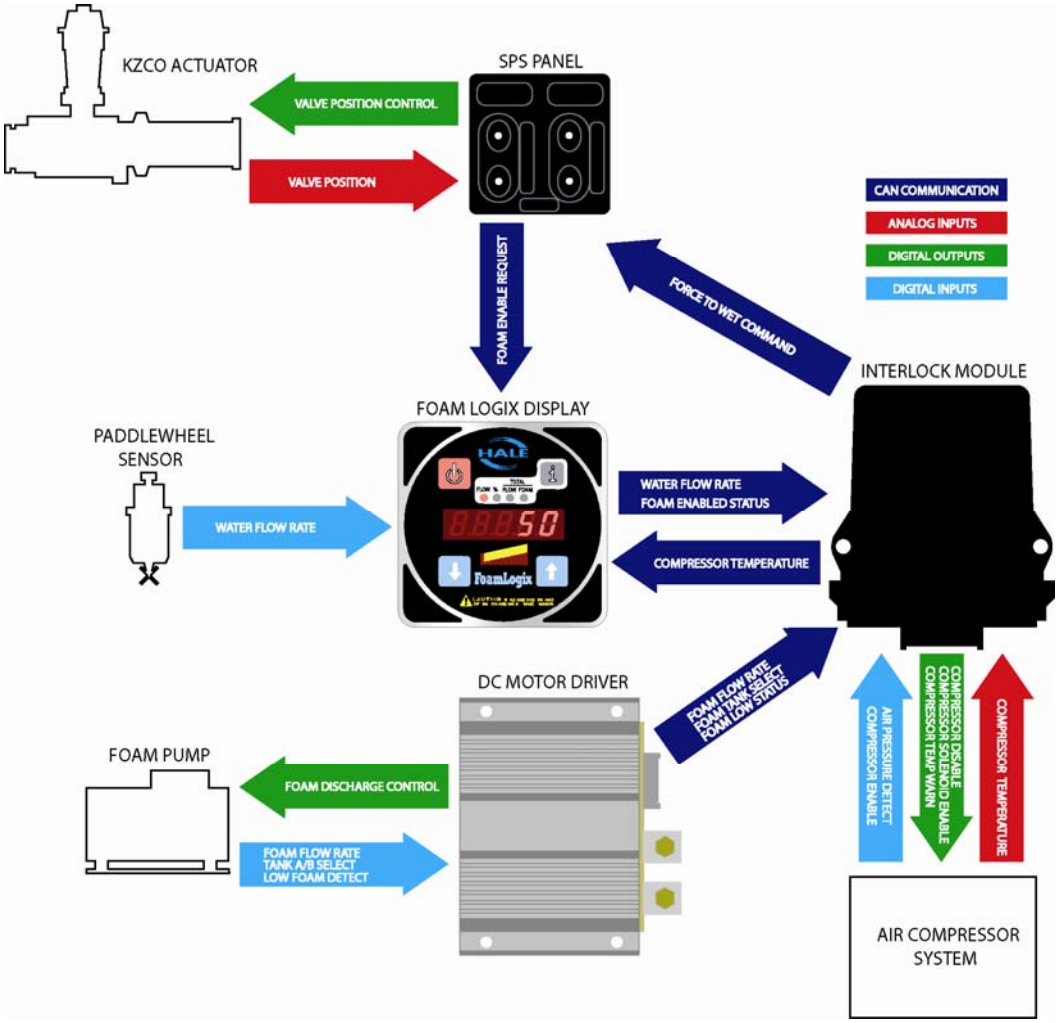
The SmartCAFS interlock module has one temperature input. Pin 6 (signal) and pin 7 (ground return) are used with a 10k NTC thermistor temperature sensor (P/N 200-1161-00-0).

2.5. CAN communication

The SmartCAFS interlock module utilizes J1939 Proprietary CAN communication protocol for transmission and reception of relevant operational messages (Pin 2 - CAN HIGH, Pin 11 – CAN LOW, Pin 3 – CAN SHIELD).

The SmartCAFS interlock module receives a status messages from the DC Motor Driver and FoamLogix display for use in the interlocking of the ***AIR INJECTION ENABLE*** output.

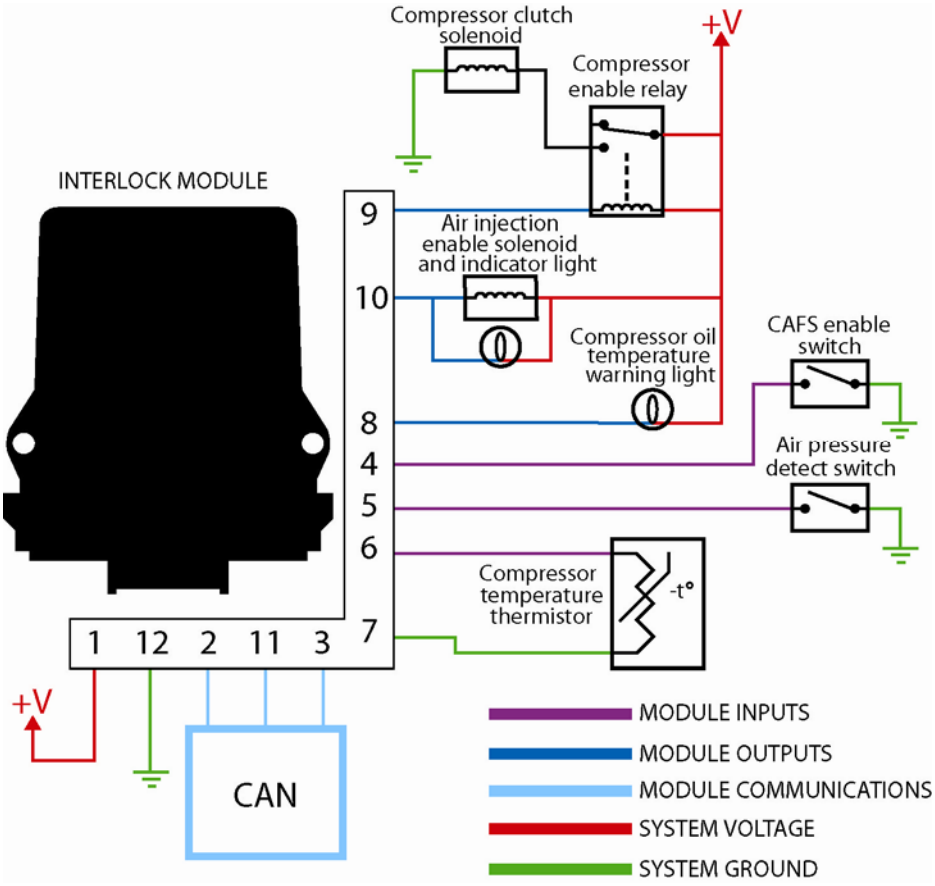
3. System diagram



The SmartCAFS interlock module receives CAN messages from the FoamLogix display and DC motor driver, and physical inputs from the compressor enable, air pressure detect, and temperature circuits.

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4. Typical installation



See sections 2.2 (digital inputs), 2.3 (low current outputs), 2.4 (temperature input), and 2.5 (CAN communication) for detailed operation.

Refer to harness P/N 114636 and electrical schematic P/N 114648 for more detail.

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5. Connector Description

The module has one connector and the following definitions apply:

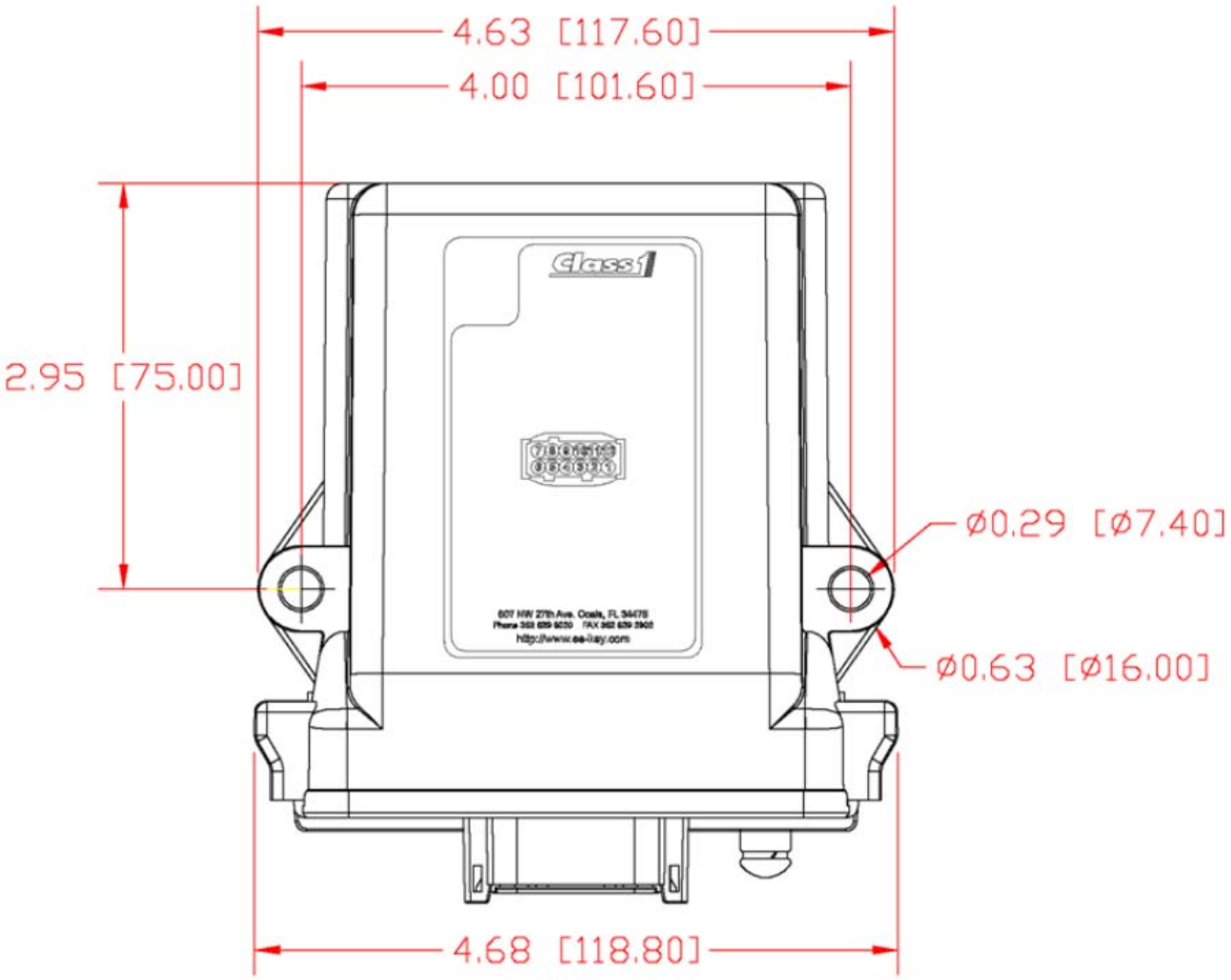
Mating Connector : DEUTSCH PN DTM06-12SA
Standard Terminals : DEUTSCH PN 0462-201-20141
Gold Terminals : DEUTSCH PN 0462-201-20131
Recommended wire gage: 14 – 18 AWG

POSITION	CIRCUIT	DESCRIPTION	
1	[S+] SUPPLY +	Module supply	(+9VDC … +32VDC)
2	[CH] CAN High	ES-Key communications	(J1939, 250KB/s)
3	[CS] CAN Shield	ES-Key communications	(J1939, 250KB/s)
4	[I-] INPUT	AIR ENABLE	(Ground polarity)
5	[I-] INPUT	AIR PRESSURE DETECT	(Ground polarity)
6	[TI] SENSOR SIG	Temperature sensor	(thermistor, NTC)
7	[T-] SENSOR GND	Temperature sensor	(thermistor, NTC)
8	[O-] OUTPUT	Compressor Oil Temp Warn	(Ground polarity)
9	[O-] OUTPUT	Compressor Enable	(Ground polarity)
10	[O-] OUTPUT	Air Injection Enable	(Ground polarity)
11	[CL] CAN Low	ES-Key communications	(J1939, 250KB/s)
12	[S-] SUPPLY -	Module supply	(vehicle ground)

Use gold terminals for all CAN mating connections. Use Standard terminals for all others.

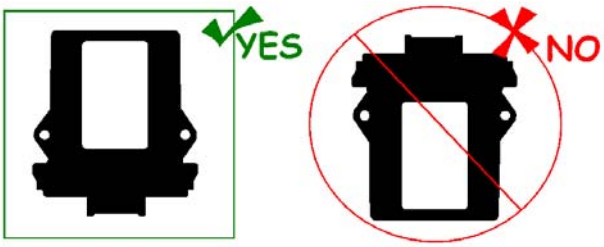
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6. Mounting



Module dimensions – inches [millimeters].

NOTE: When mounting the module vertically, make certain the connector is pointed down so as to eliminate the possibility of standing water in the connector.



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7. Diagnostics

The SmartCAFS interlock module has 3 LEDs which are viewable through the top of the amber enclosure.

PWR - +5VDC logic power
BUS - +9…+32VDC Module power
COM - Module status indicator

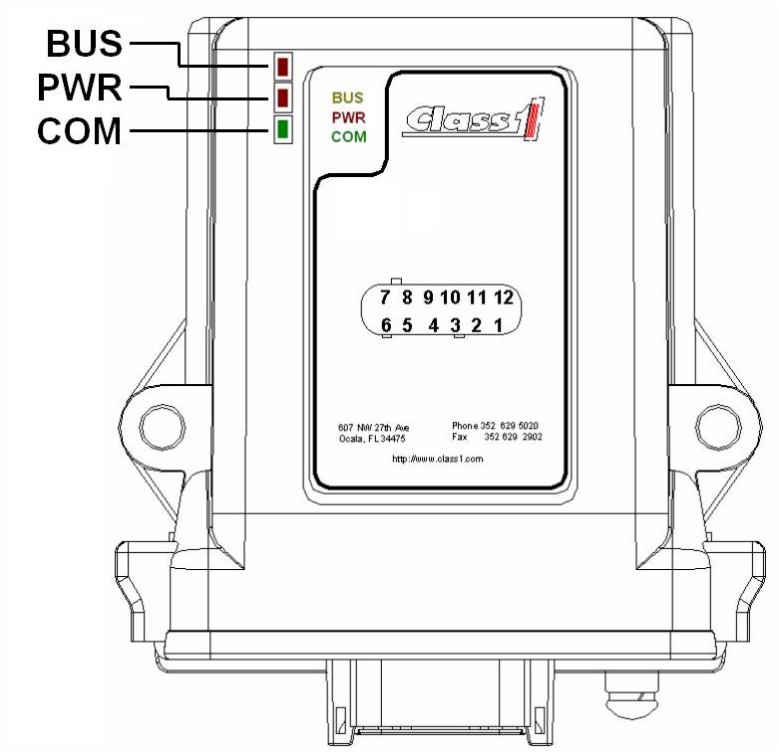
The COM LED indicates the module's CAN communication status.

On Solid
Module on-line

Flashing slow (2Hz)
CAN bus okay, but the module is not receiving messages from the DC motor driver.

Flashing fast (8Hz)
CAN bus error, no communications or not connected.

Double flash
CAN bus has an *ACTIVE* error, no communications.



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8. Technical details

Product category	FOAM / CAFS
Voltage range	+9VDC…+32VDC
Power consumption @13.8VDC @27.6VDC	Logic supply+ input (pin 1) 36mA 60mA
Output power	500mA per ground polarity output (suitable for inductive loads)
Operational temperature range	-40ºC…+85ºC
Environmental range	IP 65
CAN specification	SAE J1939 proprietary, 250 Kbits/second
LED	1 green, 1 yellow, and 1 red LED for power and communication status
Protection	Internal thermal fuse (750mA on pin 1) Reverse voltage protection (pins 1 and 12) CAN buses protected to 24V ESD voltage protected to SAE J1113 specification for heavy duty trucks (24V) Transient voltage protected to SAE J1113 specification for heavy duty trucks (24V) Load dump voltage protected to SAE J1113 specification for heavy duty trucks (24V) Outputs protected for short circuit and thermal overload
Dimensions (W x L x H) in inches [mm]	4.68 [118.87] x 5.24 [133.10] x 1.40 [35.56]

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9. 板料信息声明 (RoHS 声明) – Declaration Information Sheet (RoHS Declaration)

9.1. 产品中有毒和有害的物质或成份的名称和含量 – (NAMES AND CONTENTS OF THE TOXIC AND HAZARDOUS SUBSTANCES OR ELEMENTS IN THE PRODUCTS)

Class1 is committed to comply with the Management Methods on Control of Pollution from Electronic Information Products of China (China RoHS). The RoHS Directive restricts substances including lead (Pb), mercury (Hg), Cadmium (Cd), hexavalent chromium (CrVI) and certain halogenated flame retardants such as polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) in electrical and electronic equipment.

零件名称 Parts	标志符 Designator	有毒和有害的物质或成份 TOXIC AND HAZARDOUS SUBSTANCES OR ELEMENTS					
		铅 (Pb)	汞 (Hg)	六价铬 (CrVI)	多溴联苯 (PBBs)	多溴二苯醚 (PBDEs)	镉 (Cd)
盒子 Box	Packing box	O	O	O	O	O	O
电容 Capacitor	C1, C2, C3, C4, C5, C6, C10, C11, C12, C13, C14, C8, C9	X	O	O	O	O	O
电容 Capacitor	C7, C15, C16, C17, C18, C20, C21	O	O	O	O	O	O
箱体 Case	Amber Deutsch	O	O	O	O	O	O
连接器 Connector	CN1	O	O	O	O	O	O
石英片 Crystal	XT1	X	O	O	O	O	O
二极管 Diode	D1, D2	O	O	O	O	O	O
二极管 Diode	D3, D4, D5	X	O	O	O	O	O
过滤器 Filter	FT1	O	O	O	O	O	O
保险丝 Fuse	F1, F2	X	O	O	O	O	O
集成电路 IC	U1, U5	O	O	O	O	O	O
集成电路 IC	U2, U3, U4, U6, U7, U8, U9, U10, U11, U12	X	O	O	O	O	O
感应器 Inductor	L1, L2	X	O	O	O	O	O
标签 Label	114761	O	O	X	O	O	O
发光二极管 LED	LED1, LED2, LED3	O	O	O	O	O	O
螺母 Nut	Mounting hardware	O	O	O	O	O	O
印制电路 PCB	111090 Rev A	X	O	O	O	O	O
压入式紧固件 PEM	Mounting hardware	O	O	O	O	O	O
电阻器 Resistor	R1, R2, R3, R4, R5, R6, R7, R8, R9, R10, R11, R16, R17, R18, R13, R14, R15, R19, R27, R28, R20, R21, R22, R23, R24, R25, R26, R29	X	O	O	O	O	O

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零件名称 Parts	标志符 Designator	有毒和有害的物质或成份 TOXIC AND HAZARDOUS SUBSTANCES OR ELEMENTS					
		铅 (Pb)	汞 (Hg)	六价铬 (CrVI)	多溴联苯 (PBBs)	多溴二苯醚 (PBDEs)	镉 (Cd)
电阻器 Resistor	R8	O	O	O	O	O	O
空间温度硫化法 RTV	Adhesive	O	O	O	O	O	O
开关弹片 Switch Dome	Keypad dome switches	X	O	O	O	O	O
晶体管 Transistor	Q1	O	O	O	O	O	O
变阻器 Varistor	MOV1, TVS1	X	O	O	O	O	O

○：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006标准规定的限量要求以下。

○：Indicates that this hazardous substance contained in all homogeneous materials of this part is below the limit requirement in SJ/T 11363-2006.

×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006标准规定的限量要求。

×：Indicates that this hazardous substance contained in at least one of the homogeneous materials of this part is above the limit requirement in SJ/T 11363-2006.



除非另外特别的标注,此标志为针对所涉及产品的环保使用期限标志.此环保使用期限只适用于产品在产品手册中所规定的条件下工作.

The Environment-Friendly Use Period (EFUP) for all enclosed products and their parts are per the symbol shown here, unless otherwise marked. The Environment-Friendly Use Period is valid only when the product is operated under the conditions defined in the product manual.

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FOR OEM DISTRIBUTION ONLY

TECHNICAL PRODUCT DATASHEET

SmartCAFS SPS PANEL

P/N 114643

smart CAFS



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TECHNICAL DATA SHEET

DATE					5-7-2007
PRODUCT GROUP	FOAM / CAFS	P/N	114643	REV	1.60
PRODUCT	SmartCAFS SPS PANEL			BY	AMS

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TECHNICAL DATA SHEET

1. Revision Log

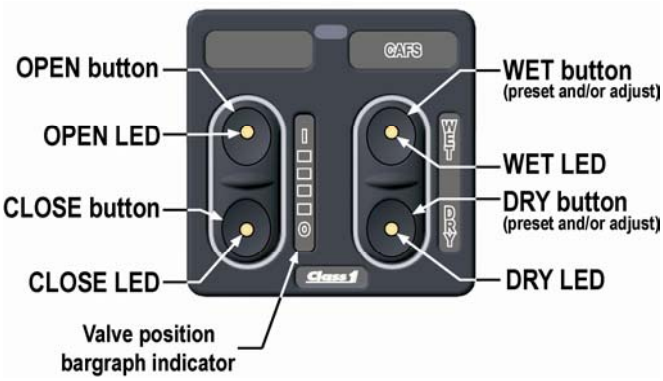
Rev	Date	Changes
1.00	2-15-2006	Initial requirements
1.10	2-21-2006	Added physical/operational valve range diagram
1.20	4-3-2006	Changed product name to SmartCAFS
1.30	9-27-2006	Included 2 operator presets within OEM configured operating range. SPS drives valve to OEM configured wet position if NO AIR is detected for three seconds (CAN message form interlock module)
1.40	12-05-2006	Added clarification to failsafe condition section. Clarified transition speed configuration section.
1.50	4-18-2007	Added information about OPEN/CLOSE button operation.
1.60	5-7-2007	Added RoHS declaration sheet.

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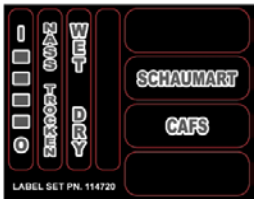
2. Module Overview

2.1. Scope

The SmartCAFS SPS Panel (C1 P/N 114643) is the primary component of the compressor based, smart-switch CAFS system. The SPS Panel allows monitoring and control of the consistency of the discharged CAFS concentrate. The SmartCAFS SPS Panel is designed for use with the Class 1 SmartCAFS Interlock Module (C1 P/N 114631). The SPS Panel come with both English and German label sets



SmartCAFS SPS panel (C1 P/N 114643) with English language label set (C1 P/N 112424)

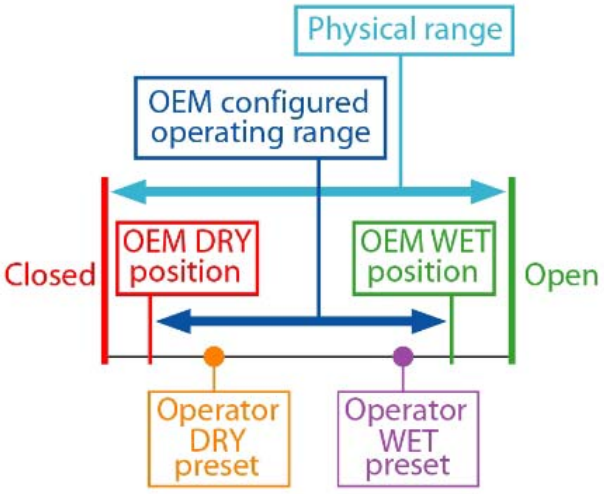


German language label set (C1 P/N 114720)

2.2. WET and DRY buttons

The WET (or DRY) button is used to position the water valve at the operator's preset position for the desired CAFS consistency. The WET button will open the valve to the operator's WET preset position, and the DRY button will close the valve to the operator's DRY preset position. The WET and DRY presets can be easily configured by the operator (see section 3.6).

The SPS Panel will only open or close the valve within the operating range configured by the OEM. The valve position bargraph indicator (section 2.6) will display one (1) bar on the bottom when the valve is positioned at the OEM configured CLOSED point and all six (6) bars when the valve is positioned at the OEM configured OPEN point. No valve movement beyond the OEM configured operating range is permitted.



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2.3. WET and DRY LEDs

The WET LED flashes when the WET button is pressed and the valve is in transit to the WET preset position. The WET LED lights steady when the valve is set to the preset WET position.
The DRY LED flashes when the DRY button is pressed and the valve is in transit to the DRY preset position. The DRY LED lights steady when the valve is set to the preset DRY position.

2.4. OPEN and CLOSE buttons

The OPEN (or CLOSE) button is used to position the valve at any point between the open and closed OEM configured points. When the OPEN (or CLOSED) button is pressed the WET (or DRY) LEDs will be turned OFF.

2.5. OPEN and CLOSE LEDs

The OPEN (or CLOSE) LED lights while the OPEN (or CLOSE) button is pressed. These LEDs will normally be off.

2.6. Valve position bargraph indicator

The valve position bargraph indicates the relative position of the valve in reference to the OEM configured OPEN and CLOSED points. Fully WET (open) will light all six (6) bars and fully DRY (closed) will light only the bottom bar.

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3. Operation

3.1. Initial power condition

The SPS Panel will drive the valve to the OEM configured OPEN (WET) position when the system is first powered on.

3.2. The WET and DRY buttons

The WET and DRY buttons allow the operator to quickly set the SmartCAFS to the desired CAFS consistency with the push of a button. The WET and DRY buttons have operator configured valve positions associated.

Press the WET button and the SPS Panel drives the valve to the operator's preset WET position.

- The WET LED flashes while the valve is moving.
- The WET LED lights steady when the valve has moved to the WET preset position.

Press the DRY button and the SPS Panel drives the valve to the operator's preset DRY position.

- The DRY LED flashes while the valve is moving.
- The DRY LED lights steady when the valve has moved to the DRY preset position.

The FoamLogix display (C1 P/N 111530) is turned ON when the WET or DRY preset button is pressed.

3.3. The OPEN and CLOSE buttons

The OPEN and CLOSE buttons allow an operator to position the valve to any point between the OEM configured OPEN and CLOSED points for controlling the desired CAFS consistency.

The OPEN button can be pressed and held or tapped to move the valve for a wetter CAFS consistency.

The CLOSE button can be pressed and held or tapped to move the valve for a less wet CAFS consistency.

The OPEN and CLOSE buttons will not function unless the FoamLogix display (C1 P/N 111530) is turned ON (manually or remotely with the preset WET/DRY button).

3.4. Failsafe condition

The SPS Panel will drive the valve to the OEM configured OPEN (WET) position as a "failsafe" when…

- The SPS Panel is initially powered.
- The Interlock Module (C1 P/N 114631) does not detect air pressure for three or more seconds.
- The DC Motor Driver (C1 P/N 110586) is not energized (or CAN bus is disconnected for three or more seconds).
- The FoamLogix Display (C1 P/N 111530) is turned OFF with its red ON/OFF button.
- The FoamLogix Display turns itself OFF because it has not detected foam flow from the DC Motor Driver (C1 P/N 110586) after 45 seconds.

3.5. Class 1 logo (diagnostic LEDs)

The Class 1 logo on the bottom of the SPS panel is lit from behind with two (2) blue LEDs and is used as a diagnostic indicator.

LEDs ON solid - SPS CAN communication okay and communicating correctly.
LEDs flashing slow - SPS CAN is okay, but not receiving messages from the FoamLogix display.
LEDs flashing fast - SPS has CAN bus error, no communications, or not connected.
LEDs alternate flashing - SPS CAN bus has an ACTIVE error (shorted CAN lines, etc).

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3.6. Configure the WET and DRY presets

The operator can set the WET and DRY presets for desired CAFS consistency.

While in the presets configure mode the valve will only move if the FoamLogix display is active and water and foam are flowing – otherwise the valve will remain in the full wet position.

3.6.1. Configure the WET preset

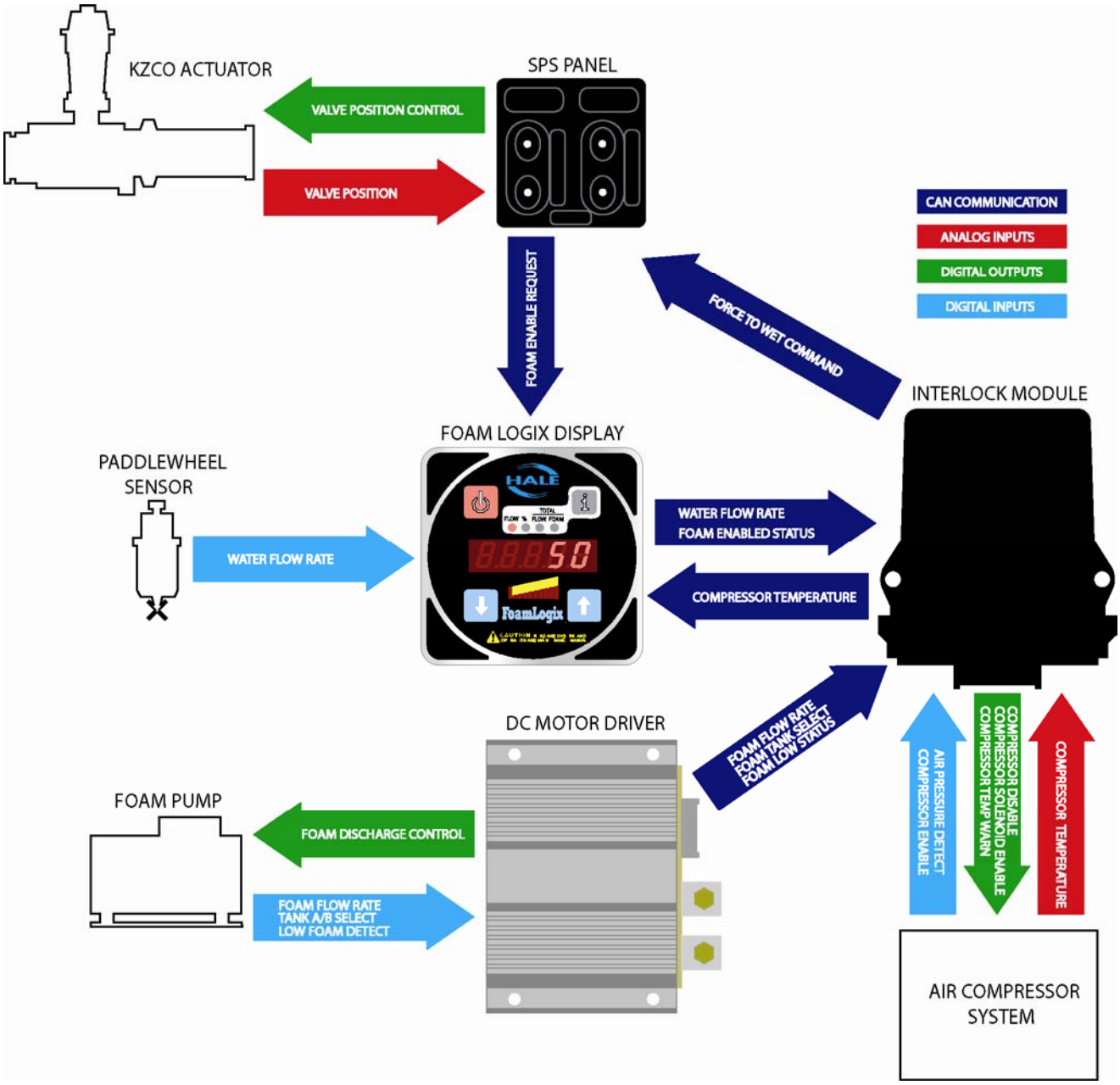
- Press and hold the WET and DRY buttons simultaneously until the WET and DRY LEDs and backlighting begin flashing (approximately three seconds). Release the buttons.
- Use the OPEN and CLOSE buttons to position the valve for the desired wet CAFS consistency.
- Press and hold the WET button until the LEDs and backlighting stop flashing (approximately two seconds).
- The WET preset has been stored and the SPS panel is operating normally.

3.6.2. Configure the DRY preset

- Press and hold the WET and DRY buttons simultaneously until the WET and DRY LEDs and backlighting begin flashing (approximately three seconds). Release the buttons.
- Use the OPEN and CLOSE buttons to position the valve for the desired dry CAFS consistency.
- Press and hold the DRY button until the LEDs and backlighting stop flashing (approximately two seconds).
- The DRY preset has been stored and the SPS panel is operating normally.

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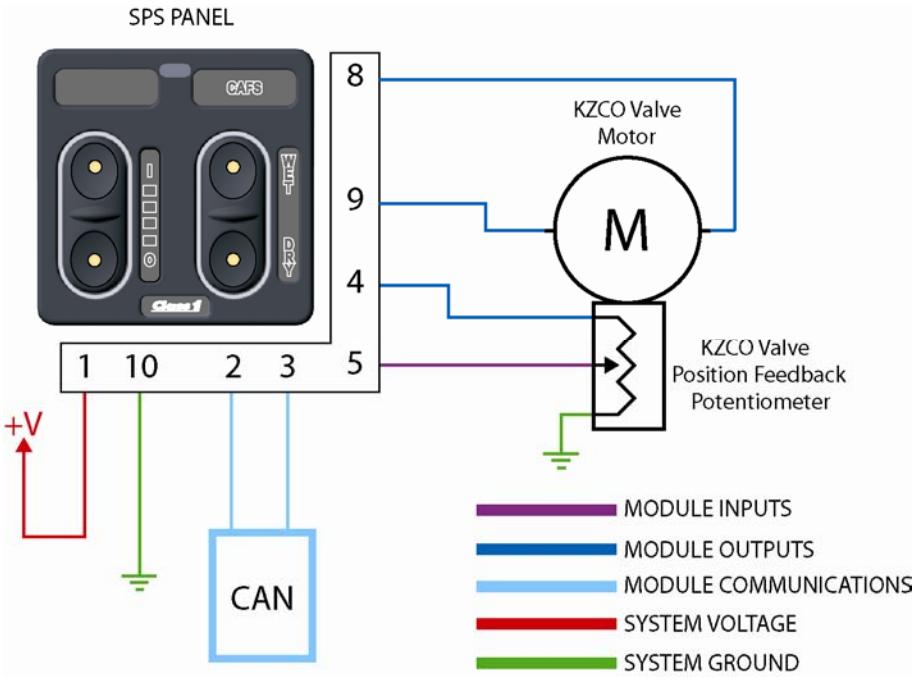
5. System diagram



The SPS panel determines the valve position based on the user's input on the panel's buttons, and the CAN message received from the interlock module.

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6. Typical installation



The SPS Panel drives the KZCO actuator motor (P/N 114635) in the desired direction by outputting one polarity (ground or power) on pin 8 and the opposite polarity on pin 9. The SPS Panel uses the position feedback from the KZCO actuator's potentiometer as an input on pin 5 to determine when the valve is set to the desired position.

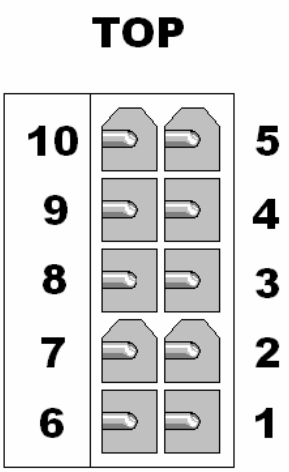
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7. Connector Description

The module has one connector and the following definitions apply:

Mating Connector: AMP 794821-1 / Class1 PN 109408
Standard Terminals: AMP 770988-1 / Class1 PN 101535
Seal: AMP 794772-8
Wire seal: AMP 794758-1
Cavity plug: AMP 794995-1
Recommended wire gage: 16 – 18 AWG

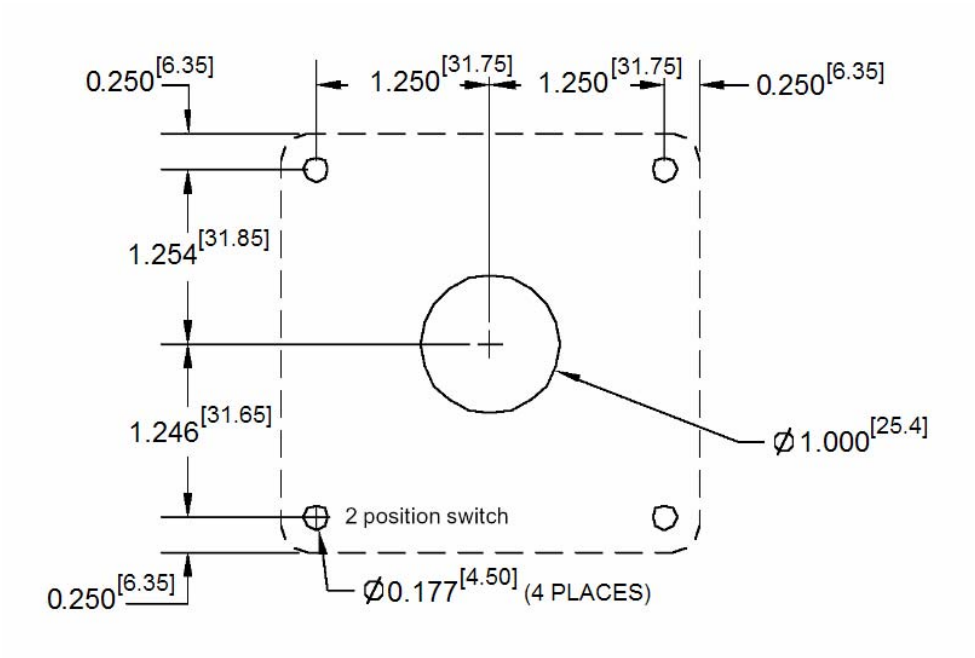
POSITION	CIRCUIT	DESCRIPTION	
1	[S+] SUPPLY +	Module supply	(+9VDC … +32VDC)
2	[CH] CAN High	ES-Key communications	(J1939, 250KB/s)
3	[CL] CAN Low	ES-Key communications	(J1939, 250KB/s)
4	[O+] OUTPUT	KZCO Position Supply	(positive, +5VDC)
5	[I+] INPUT	KZCO Position Signal	(analog, 0-5VDC)
6	X	Not used	
7	X	Not used	
8	[O±] OUTPUT	KZCO Motor Direction	(± polarity, direction based)
9	[O±] OUTPUT	KZCO Motor Direction	(± polarity, direction based)
10	[S-] SUPPLY -	Module supply	(vehicle ground)



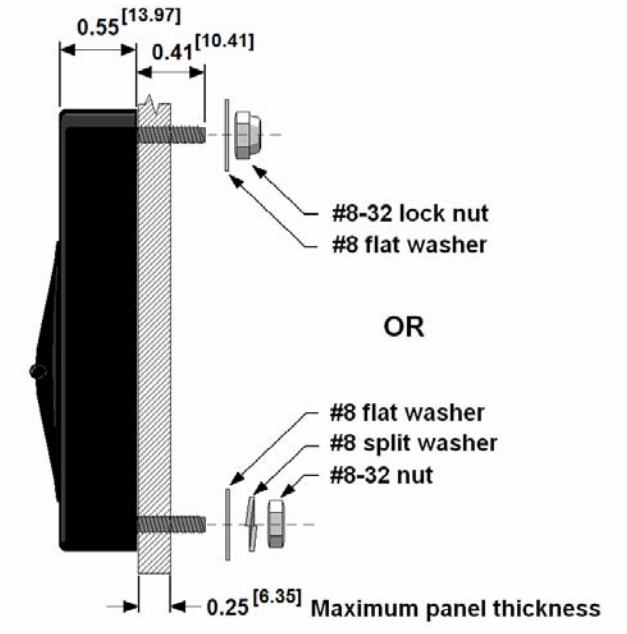
Connector pin position detail (SPS view).

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8. Mounting



Panel cutout dimensions – inches [millimeters].



Mounting hardware and dimensions – inches [millimeters].

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9. Technical details

Product category	FOAM / CAFS
Voltage range	+9VDC…+32VDC
Power consumption @13.8VDC @27.6VDC	Logic supply+ input (pin 1) 125mA 82mA
Output power	2A each output (pin 8 and 9)
Operational temperature range	-40ºC…+85ºC
Environmental range	IP 65
CAN specification	SAE J1939 proprietary, 250 Kbits/second
Protection	Internal thermal fuse (750mA on pin 1) Reverse voltage protection (pins 1 and 10) CAN buses protected to 24V ESD voltage protected to SAE J1113 specification for heavy duty trucks (24V) Transient voltage protected to SAE J1113 specification for heavy duty trucks (24V) Load dump voltage protected to SAE J1113 specification for heavy duty trucks (24V) Outputs protected for short circuit and thermal overload
Dimensions (W x L x H) in inches [mm]	2.50 [63.5] x 2.50 [63.5] x 0.55 [14.0]

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10. 板料信息声明 (RoHS 声明) – Declaration Information Sheet (RoHS Declaration)

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Class1 is committed to comply with the Management Methods on Control of Pollution from Electronic Information Products of China (China RoHS). The RoHS Directive restricts substances including lead (Pb), mercury (Hg), Cadmium (Cd), hexavalent chromium (CrVI) and certain halogenated flame retardants such as polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) in electrical and electronic equipment.

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		铅 (Pb)	汞 (Hg)	六价铬 (CrVI)	多溴联苯 (PBBs)	多溴二苯醚 (PBDEs)	镉 (Cd)
盒子 Box	Packing box	O	O	O	O	O	O
电容 Capacitor	C2, C6, C7, C8, C10, C16, C17, C18, C19, C4, C5, C1	X	O	O	O	O	O
电容 Capacitor	C13, C3, C9, C14, C15, C11, C12	O	O	O	O	O	O
连接器 Connector	Amp connector	O	O	O	O	O	O
石英片 Crystal	XT1	X	O	O	O	O	O
二极管 Diode	D1, D2, D13, D14	O	O	O	O	O	O
二极管 Diode	D3, D4, D5, D6, D7, Z1	X	O	O	O	O	O
过滤器 Filter	FT1	O	O	O	O	O	O
保险丝 Fuse	F1, F2	X	O	O	O	O	O
集成电路 IC	U10, U11, U3, U1, U5, U12	O	O	O	O	O	O
集成电路 IC	U2, U6, U9	X	O	O	O	O	O
感应器 Inductor	L1, L2	X	O	O	O	O	O
键盘 Keypad	Rubber keypad	O	O	O	O	O	O
标签 Label	Class1, OPEN/CLOSE, WET/DRY	O	O	X	O	O	O
发光二极管 LED	LED1, LED2, LED3, LED4, LED5, LED6, LED7, LED8, LED9, LED10, LED11, LED12, LED13, LED14, LED15, LED16, LED17, LED18, LED19, LED20, LED21, LED22, LED23, LED28, LED29, LED30, LED31, LED32, LED33, LED34, LED35, LED36, LED37, LED38, LED39, LED40, LED41, LED42, LED43, LED44, LED45, LED46, LED47, LED48, LED49, LED50, LED26, LED27, LED24, LED25, LED51, LED52	O	O	O	O	O	O

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TECHNICAL DATA SHEET

				DATE	5-7-2007
PRODUCT GROUP	FOAM / CAFS	P/N	114643	REV	1.60
PRODUCT	SmartCAFS SPS PANEL			BY	AMS

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螺母 Nut	Mounting hardware	O	O	O	O	O	O
印制电路 PCB	112427 Rev B	X	O	O	O	O	O
压入式紧固件 PEM	Mounting hardware	O	O	O	O	O	O
电阻器 Resistor	R1, R10, R11, R18, R19, R20, R21, R14, R15, R16, R17, R22, R3, R13, R9, R4, R6, R23	X	O	O	O	O	O
电阻器 Resistor	R8	O	O	O	O	O	O
开关弹片 Switch Dome	Keypad dome switches	X	O	O	O	O	O
晶体管 Transistor	Q1	O	O	O	O	O	O
变阻器 Varistor	MOV1	X	O	O	O	O	O

○：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006标准规定的限量要求以下。

○：Indicates that this hazardous substance contained in all homogeneous materials of this part is below the limit requirement in SJ/T 11363-2006.

×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006标准规定的限量要求。

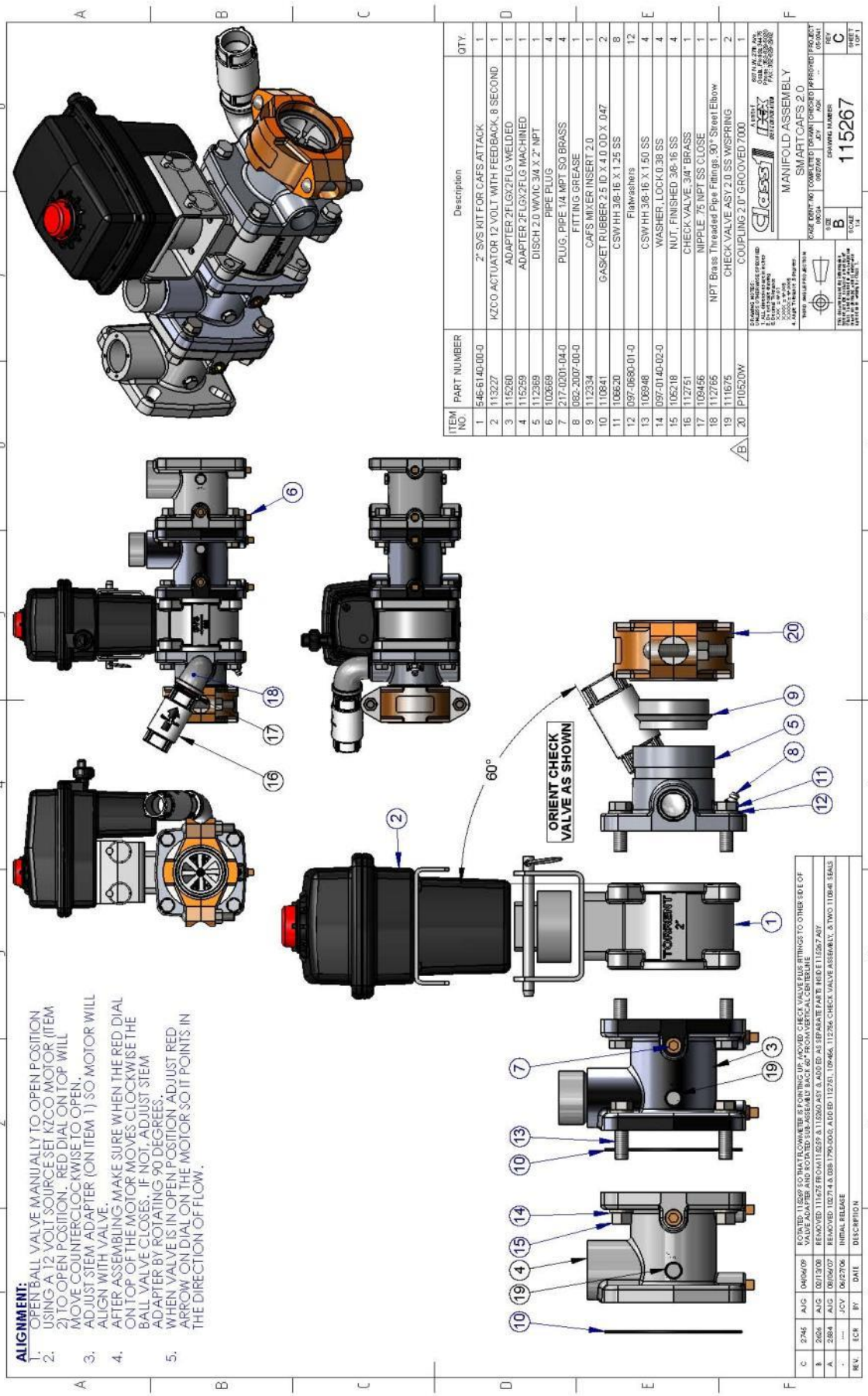
×：Indicates that this hazardous substance contained in at least one of the homogeneous materials of this part is above the limit requirement in SJ/T 11363-2006.



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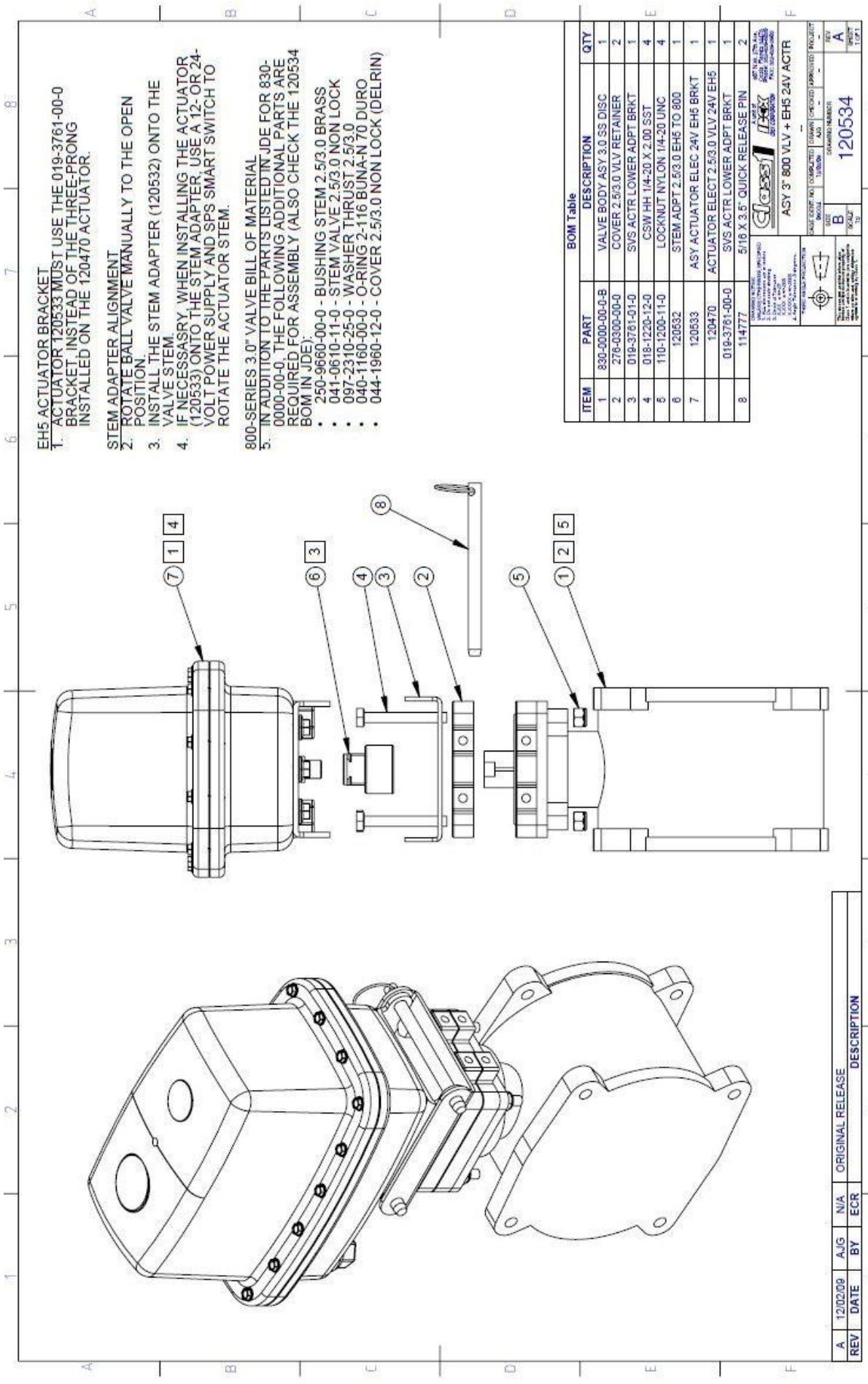


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SMARTCAFS ACTUATOR ASSEMBLY →

FIRE SUPPRESSION GROUP

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FOAM CONCENTRATE COMPATIBILTY LIST →

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Hale Foam Proportioning System
Foam Concentrate Compatibility

These Class A Foam concentrates have been tested and approved for use in all Hale Foam Proportioning Systems: SmartFOAM and FoamLogix® ™ models 6.5, 5.0, 3.3, 2.1A, 1.7AHP, and Hale V-Series.

TYPE OF FOAM CONCENTRATE	MANUFACTURER	NAME
CLASS A FOAM		
US Forestry Service Approved - ***Reference*** [1] ***and*** [2]	Ansul	SILV-EX Class A Foam Concentrate
	Angus Fire	Forexpan S (0.1%-1.0%)
		Hi-Combat Class A (1st Defense Class A Cold Water Foam)
	Kerr Fire	Kerr Forest Foam (0.1%-1.0%)
	National Foam	Knock-Down
	Solberg	Fire-Brake Class A foam (3150A)
	ICL Performance Products	Phos-Chek® WD881
		First Response
	Chemonics	Fire-Trol Fire Foam 103
		Fire-Trol Fire Foam 104
	3M	Light Water FT-1150
	Chemguard	First Class – Class A Foam P/N 5100-307
Non U.S. Forestry Service Approved - ***Reference*** [1]	ChemGuard	Class A Plus
	Unifoam Co. Ltd.	UniA 1%
	3M	Light Water SFFF
	National Foam	Responder
	Angus Fire	FirePower Class A
	Fire Response Systems, Inc.	Class A - Fire Stop-R CCR# GOLD7386
	Dr. Stahamer	Sthamex-Class-A Synthetic Class A Foam

[1] *For use in SmartFOAM and FoamLogix models 6.5, 5.0, 3.3, 2.1A, 1.7AHP and Hale V-Series*

[2] *USFS approved foams have been tested for corrosion and biodegradability toxicity by the US Forest Service in addition to the Hale testing described on the following page.*

Hale Products, Inc.
607 NW 27th Ave., Ocala, FL 34475
P: 800.533.3569 F: 800.520.3473 haleproducts.com

Hale Foam Proportioning System
Foam Concentrate Compatibility

These Class B Foam concentrates have been tested and approved for use in Hale Foam Proportioning Systems: SmartFOAM and FoamLogix models 6.5, 5.0, 3.3.

TYPE OF FOAM CONCENTRATE	MANUFACTURER	NAME
CLASS B FOAM		
AFFF- Alcohol Resistant Concentrates	3M	3% Alcohol Type AFFF Concentrate (P/N 98-0211-6573-7)
	Ansul	3x3 Low Viscosity Alcohol Resistant Concentrate
		T'storm ATC AR-AFFF 1% or 3%
	ChemGuard	AR 3%-6% Part # CAR36P
		AR-AFFF, 3%x3%, Part # C333
		Ultraguard 1%-3% Part # C133
		3%-6% AR-AFFF Product # C361
		3%-6% AR-AFFF Product # C363
	National Foam	Universal Gold 3% AR-AFFF
		Universal Gold 1% - 3% AR-AFFF
	US Foam	1-3% Alcohol Resistant AFFF (P/N US- AR13)
		3-6% Alcohol Resistant AFFF (P/N US-FCAR36)
	Angus Fire	Niagara 3-3 – AR-FFFP (Class B)
	Solberg Scandinavian AS	Arctic Foam RF 3x6 ATC – Synthetic AR Foam Concentrate (Class B)
	Williams fire	ThunderStorm® ATC AR-AFFF 1% or 3% F-601B
AFFF	National Foam	1% Aero-Water
SPECIALTY FOAM CONCENTRATES		
Protein	National Foam	Terra Foam 3% CF
	Chemonics	Durra Foam 3%
FIRE FIGHTING WATER ADDITIVE		
	Hazard Control Tech.	F-500 (1%, 3%, 6%)
	SPL Control LLC	Pyrosolv (FF Agent – 6% Solution) P/N-720328 (MSDS#)
	Novacool	UEF 0.4%
	Fire Blockade	Fire Extinguishing Agent, 0.4 - 6.0% No. 3000-1003
	FireAde 2000	Fire Fighting Emulsifier 0.25-6% P/N FA2000-5
	FIRE CAP Fire Suppression Products, Inc	Fire Cap 0.25%-6%
	Verde Environmental Inc.	Micro-Blaze Out 2-3%
	Bio Ex S.A.S	Bio for N – FSFF (Fluoro Surfactant Free Foam) Wetting Agent. (Class A)
		Ecopol AR-FFF (Fluoro compound-Free Foam) (Class B)

Hale Products, Inc.
607 NW 27th Ave., Ocala, FL 34475
P: 800.533.3569 F: 800.520.3473 haleproducts.com

Hale Foam Proportioning System
Foam Concentrate Compatibility

The above foam concentrates have been tested by Hale Products in a Hale SmartFOAM/FoamLogix® system to ensure compatibility with Hale SmartFOAM/FoamLogix® models 6.5, 5.0, and 3.3 Foam Proportioning Systems. These Chemicals were ran for several hundred hours over several months under nominal conditions to make sure they do not harm the Foam System. This list is solely intended to assist the end user in selection of foam concentrate(s) compatible with a Hale SmartFOAM/FoamLogix® Model 6.5, 5.0, and 3.3 and is not a determination of the fire fighting effectiveness of one product over another. Always consult with NFPA standards, U.L. Listings, Federal, State, and local regulations, and requirements pertaining to application and environmental regulations before selecting a foam concentrate. Some of the foam chemicals listed may require special hardware considerations. (Refer to SmartFOAM/FoamLogix® user manual for additional information). Many Fire Fighting Foam Chemical Manufacturers have specific instructions on handling and use of their products including, but not limited to, shelf life, tank life, temperature limits, and intervals between use. Always follow manufacturer's instructions for use.

This bulletin applies to Hale SmartFOAM/Foamlogix® foam pumps built after April 17, 1997. For Hale FoamMaster foam pumps built prior April 17, 1997 refer to Bulletin 650, Rev 2.

If a particular foam concentrate you wish to use does not appear on this list, please contact your Hale representative for information concerning compatibility with Hale SmartFOAM/FoamLogix® Foam Proportioning System. As further testing is completed, Hale Products Inc. updates this list and expands capabilities and features to keep the Hale SmartFOAM/FoamLogix® the best system available for all the fires you fight.

Revision	Date	By	Description
H	11-18-2015	AMS	Added Kerr Forest Foam. Solberg Fire-Brake moved to USFS approved.
G	11-5-2015	AMS	Changed 3M Fire-Brake to Solberg Fire-Brake.
F	10-29-2015	AMS	Updated Class A list.
E	05-01-2015	JCVM	Preliminary Release.

HALE FOAM PROPORTIONING SYSTEM FOAM CONCENTRATE COMPATIBILITY

The following foam concentrates are approved for use in Hale Foam Proportioning Systems.

The Class A Foam concentrates are approved for use in all Hale Foam Proportioning Systems (Hale FoamLogix® ™ 5.0, 3.3, 2.1A and Hale V-Series)

TYPE OF FOAM CONCENTRATE	MANUFACTURER	NAME
CLASS A FOAM		
US Forestry Service Approved - Reference * & **	Ansul	Silvex Class A Foam Concentrate
	Kidde Fire Fighting/ Angus Fire	Forexpan S (0.1%-1.0%)
	Kidde Fire Fighting/ Angus Fire	Hi Combat Class A (1st Defense Class A Cold Water Foam)
	Kidde Fire Fighting/ National Foam	Knock-Down
	Monsanto	PhosCheck WD881
	Chemonics	Fire-Trol Fire Foam 103
	Chemonics	Fire-Trol Fire Foam 104
	3M	Light Water FT-1150
	Chemguard	First Class – Class A Foam P/N 5100-307
* For use in Foamlogix® model 5.0, 3.3, and 2.1A and Hale V-Series ** USFS approved foams have been tested for corrosion and biodegradability toxicity by the US Forrest Service in addition to the Hale testing described on the following page.		
Non U.S. Forestry Service Approved - Reference *	ChemGuard	Class A Plus
	Unifoam Co. Ltd.	UniA 1%
	3M	Light Water SFFF
	Kidde Fire Fighting/ National Foam	Responder
	Kidde Fire Fighting/ Angus Fire	FirePower Class A
	3M – Australia	Fire-Brake Bush Fire Fighting Foam P/N 0295337
	Fire Response Systems, Inc.	Class A - Fire Stop-R CCR# GOLD7386

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HALE FOAM PROPORTIONING SYSTEM FOAM CONCENTRATE COMPATIBILITY

The Class B foam, specialty foam, and firefighting water additive concentrates are approved for use in FoamLogix® 5.0 and 3.3 foam proportioning systems only.		
CLASS B FOAM		
AFFF- Alcohol Resistant Concentrates	3M	3% Alcohol Type AFFF Concentrate (P/N 98-0211-6573-7)
	Ansul	3x3 Low Viscosity Alcohol Resistant Concentrate
	ChemGuard	AR 3%-6% Part # CAR36P
	ChemGuard	AR-AFFF, 3%x3%, Part # C333
	ChemGuard	Ultraguard 1%-3% Part # C133
	ChemGuard ChemGaurd	3%-6% AR-AFFF Product # C361 3%-6% AR-AFFF Product # C363
	Kidde Fire Fighting/ National Foam	Universal Gold 3% AR-AFFF
	Kidde Fire Fighting/ National Foam	Universal Gold 1% - 3% AR-AFFF
	US Foam	1-3% Alcohol Resistant AFFF (P/N US-AR13)
	US Foam	3-6% Alcohol Resistant AFFF (P/N US-FCAR36)
	Ansul	T'storm ATC AR-AFFF 1% or 3%
AFFF	Kidde Fire Fighting/ National Foam	1% Aero-Water

SPECIALTY FOAM CONCENTRATES		
Protein	Kidde Fire Fighting/ National Foam	Terra Foam 3% CF
	Chemonics	Durra Foam 3%
FIRE FIGHTING WATER ADDITIVE		
	Hazard Control Tech.	F-500 (1%, 3%, 6%)
	SPL Control LLC	Pyrosolv (FF Agent – 6% Solution) P/N-720328 (MSDS#)
	Pyrocool Technologies, Inc.	FEF 0.4%
	Fire Blocade	Fire Extinguishing Agent, 0.4 - 6.0% No. 3000-1003
	FireAde 2000	Fire Fighting Emulsifier 0.25-6% P/N FA2000-5
	FIRE CAP Fire Suppression Products, Inc	Fire Cap 0.25%-6%
	Verde Environmental Inc.	Micro-Blaze Out 2-3%

Bulletin #650, Rev 32, 7-17-07

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HALE FOAM PROPORTIONING SYSTEM FOAM CONCENTRATE COMPATIBILITY

The above foam concentrates have been tested by Hale Products in a Hale FoamLogix® system to ensure compatibility with Hale FoamLogix® models 5.0 and 3.3 Foam Proportioning Systems. These Chemicals were ran for several hundred hours over several months under nominal conditions to make sure they do not harm the Foam System. This list is solely intended to assist the end user in selection of foam concentrate(s) compatible with a Hale FoamLogix® Model 5.0 and 3.3 and is not a determination of the fire fighting effectiveness of one product over another. Always consult with NFPA standards, U.L. Listings, Federal, State, and local regulations, and requirements pertaining to application and environmental regulations before selecting a foam concentrate. Some of the foam chemicals listed may require special hardware considerations. (Refer to FoamLogix® user manual for additional information). Many Fire Fighting Foam Chemical Manufacturers have specific instructions on handling and use of their products including, but not limited to, shelf life, tank life, temperature limits, and intervals between use. Always follow Manufacturers instructions for use.

This Bulletin applies to Hale Foamlogix® foam pumps built after April 17, 1997. For Hale FoamMaster foam pumps built prior April 17, 1997 refer to Bulletin 650, Rev 2.

If a particular foam concentrate you wish to use does not appear on this list, please contact your Hale representative for information concerning compatibility with Hale FoamLogix® Model 5.0 or 3.3 Foam Proportioning System. As further testing is completed, Hale Products Inc. updates this list and expands capabilities and features to keep the Hale FoamLogix® the best system available for all the fires you fight.

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THERMAL RELIEF VALVE INSTRUCTIONS

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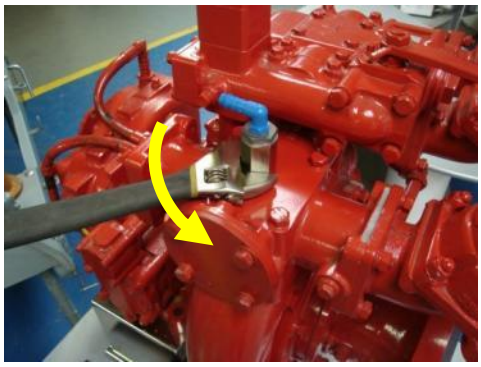
Thermal relief valve maintenance

The Thermal Relief Valve (TRV) fitted to World Series and Prima model pumps usually requires minimum maintenance attention, but should the valve be failing to open at the specified temperature or remaining open after the water temperature has lowered, follow these instructions to clean the valve.

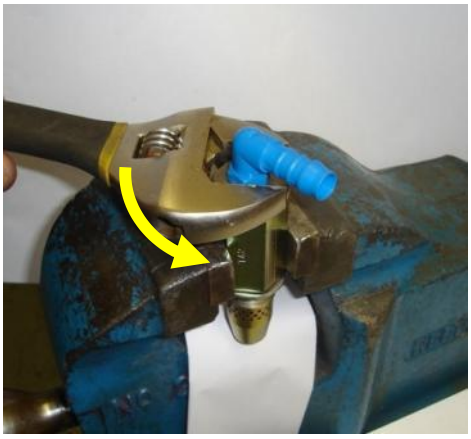
1. Location. The TRV is located on the top surface of the discharge manifold –



2. Remove the TRV with a suitable adjustable spanner to grip the main TRV body.



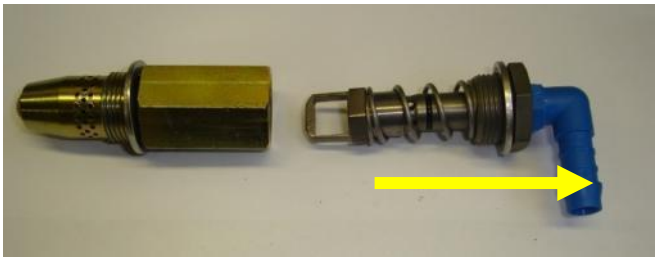
3. Remove the internal parts from the outer housing. Secure the TRV vertically in a vice. With an adjustable spanner undo the top part of the TRV.



4. The TRV internal parts will now slide out of the housing

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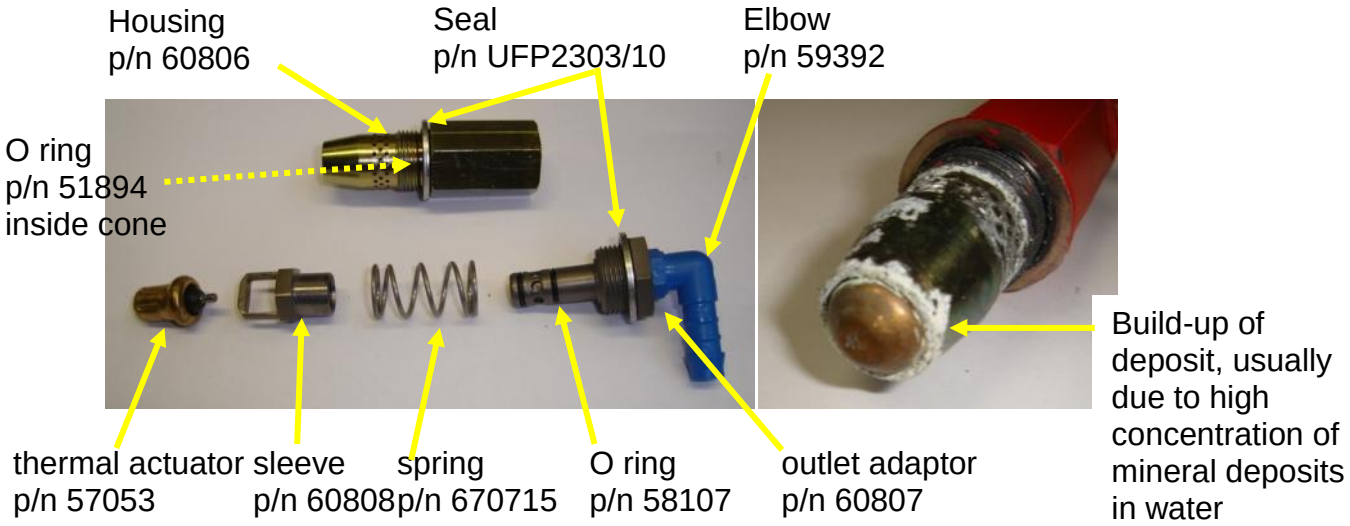
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5. The thermal actuator (p/n 57053) can now be pushed out of the main housing from the cone end for inspection



6. All the main internal parts can now be inspected for wear and/or the build-up of mineral deposits.
If there is significant deposit build-up, this can be removed by cleaning the outer housing and internal parts in a proprietary lime scale remover.



Faulty operation could be due to the sleeve (p/n 60808) sticking in a closed or open position on the outlet adaptor (p/n 60807). Also, if the O rings (p/n 58107) are worn or damaged there will be an inadequate seal allowing water to discharge unnecessarily.

7. Re-assembly is a reversal of the dismantling process. If new O rings (p/n 58107) are to be fitted, roll the first O ring into the lower groove on the outlet adaptor, then roll the second O ring over the first O ring in to the second groove higher up the adaptor. Apply water resistant grease to the new O rings and the grooves to facilitate fitting.

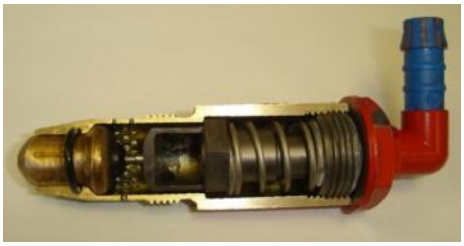
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NB: Service Parts Required – Seal, UFP2303/10, 1 off. O ring, 58107, 2 off.



Fit this O ring first

Fit this O ring second



Cross section of assembled TRV

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FLOW SENSOR REPLACEMENT INSTRUCTIONS

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FORM-ENG-0014 REV C 01-25-06

Class 1 IDEX
607 NW 27th Ave
Ocala, FL 34475
Ph: 352-629-5020 or 1-800-533-3569
Fax: 352-629-290 or 1-800-520-3473

PRODUCT / SERVICE BULLETIN		BULLETIN#	0028
		REVISION	1
PRODUCT	FOAMLOGIX 2.1A & 1.7AHP SYSTEMS	PAGE	1 OF 2
SUBJECT	FOAM FLOW SENSOR REPLACEMENT INSTRUCTIONS	DISTRIBUTION	X INTERNAL X EXTERNAL

1 REPAIR KITS 120421 & 120421-01 INCLUDE:

- Brass Housing with sensor & ball valve
- Two o-rings (040-0340-00-0)
- 121628 - Product/Service Bulletin 0028

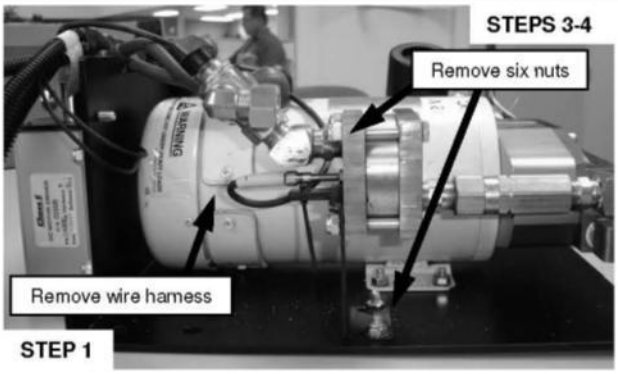
2 REQUIRED TOOLS:

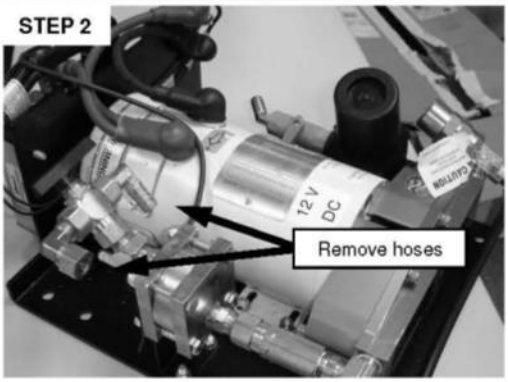
- 7/16" wrench (2X)

3 SAFETY INFORMATION

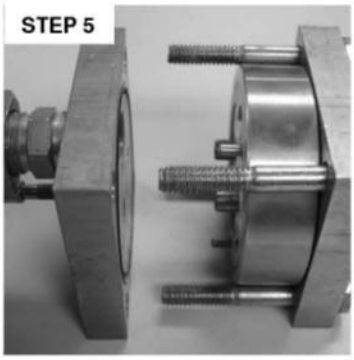
- Remove system power from the FoamLogix system and relieve any trapped pressure.
- Shut off foam tank supply valve.
- Open bypass valve to drain foam lines and use suitable containers to collect residual foam concentrate.
- Protect eyes and skin from foam concentrate per manufacturer's Material Safety Data Sheet or MSDS.

4 REPLACEMENT INSTRUCTIONS





1. Carefully disconnect the wire harness from the old foam flow sensor.
   - Connect the NEW foam flow sensor to the wire harness.
   - Apply system power and verify sensor diagnostic LED is off.
   - Touch end of sensor to brass housing → LED should light.
   - Disconnect the wire harness from the new sensor.
   - Remove system power from the FoamLogix system.
   - (This test verifies that the new sensor is operating correctly.)
2. Disconnect both hoses from the 3-way bypass valve.
3. Remove the four (4) nuts on the brass flowmeter assembly with the two 7/16" wrenches.
4. Remove the two (2) nuts on the bracket bottom with the 7/16" wrench.
5. Remove the sensor side brass cover of the flowmeter assembly.
   - Inspect o-ring inside the cover for damage or cuts. If the o-ring is damaged, replace it with a new one from this kit.
   - Depending on the return instructions provided by the dealer or manufacturer, it may be necessary to return the old sensor. If not, then the sensor and brass cover can be discarded.
6. Remove and inspect the two plastic rotors inside the flowmeter assembly for cracks, burrs, etc.
7. Inspect the inner housing for debris, metal shavings, etc. and remove as necessary.



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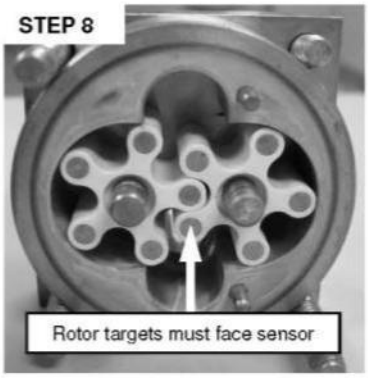
Class 1 IDEX	PRODUCT / SERVICE BULLETIN	BULLETIN#	0028
607 NW 27th Ave Ocala, FL 34475 Ph: 352-629-5020 or 1-800-533-3569 Fax: 352-629-290 or 1-800-520-3473		REVISION	1
	PRODUCT: FOAMLOGIX 2.1A & 1.7AHP SYSTEMS	PAGE	2 OF 2
	SUBJECT: FOAM FLOW SENSOR REPLACEMENT INSTRUCTIONS	DISTRIBUTION	X INTERNAL X EXTERNAL

8. Reinstall both rotors, making sure that each spins freely without binding.

   When installed, the flush end of the metal targets in the rotors must face out, toward the foam flow sensor.

9. Reinstall the o-ring (if necessary) and attach the new brass cover (with foam sensor protective bracket) and the lower support bracket with the six (6) nuts.
   - Tighten all nuts securely and torque to a maximum 6.5 ft-lb (8.5 N-m). Use a criss-cross torque pattern on the four brass housing nuts and bolts.
10. Reattach foam lines and foam flow sensor harness to the new sensor bulkhead connector.
11. Apply system power to the FoamLogix system and recalibrate the system per the user manual instructions.

STEP 8



REV	DATE	BY	DESCRIPTION
A	10/08/10	AJG	ORIGINAL RELEASE



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